

34-57

JOURNAL

OF

THE CHEMICAL SOCIETY.

ABSTRACTS OF PAPERS

ON

PHYSICAL, INORGANIC, MINERALOGICAL.

PHYSIOLOGICAL, AGRICULTURAL,

AND

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INSTRUCTIONS TO ABTRACTORS,

GIVING THE

NOMENCLATURE AND SYSTEM OF NOTATION

ADOPTED IN THE ABSTRACTS.

The object of the abstracts of chemical papers published elsewhere than in the Transactions of the Society is to furnish the Fellows with a concise account of the progress of chemical science from month to month. It must be understood that as the abstracts are prepared for the information of the Fellows in general, they cannot possibly be made so full or so detailed as to obviate on the part of those who are engaged on special investigations the necessity of consulting the original memoirs.

1. Titles of papers must be given literally.
2. Before beginning to write the abstract, the whole of the original paper must be read, in order that a judgment may be formed of its importance and of the scale on which the abstract should be made.
3. In the case of papers dealing with subjects not strictly chemical, the abstract should refer only to matters of chemical interest in the original.
4. The abstract should consist mainly of the expression, in the abstractor's own words, of the substance of the paper.
5. The abstract should be made as short as is consistent with a clear and accurate statement of the author's results.
6. If an abstract of a paper on the same subject, either by the author of the paper abstracted, or by some other author, has already appeared, note should, as a rule, be made of this fact.
7. Matter which has appeared once in the *Abstracts* is not to be abstracted again, a reference being given to the volume in which the abstract may be found.
8. As a rule, details of methods of preparation or analysis, or generally speaking of work, are to be omitted, unless such details are essential to the understanding of the results, or have some independent value. Further, comparatively unimportant compounds, such as the inorganic salts of organic bases or acids, should be mentioned quite shortly. On the other hand, data such as melting and boiling points, sp. gr., specific rotation, &c., must be given in every case unless recorded in earlier papers.

Nomenclature.

9. Employ names such as *sodium chloride*, *potassium sulphate* for inorganic compounds, and use the terminals *ous* and *ic* only in distinguishing compounds of different orders derived from the same elementary radicle; such, for instance, as mercurous and mercuric chlorides, sulphurous and sulphuric acids.

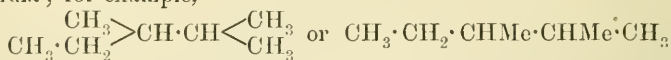
10. Term compounds of metallic radicles with the OH-group *hydroxides* and not hydrates, the name hydrate being reserved for compounds supposed to contain water of combination or crystallisation.

11. Term salts containing an amount of metal equivalent to the displaceable hydrogen of the acid, *normal* and not neutral salts, and assign names such as sodium hydrogen sulphate, disodium hydrogen phosphate, &c., to the acid salts. Basic salts as a rule are best designated merely by their *formulae*.

12. Names in common use for oxides should be employed, for example: NO, nitric oxide; CO₂, carbon dioxide; P₄O₁₀, phosphoric oxide; As₄O₆, arsenious oxide; Fe₂O₃, ferric oxide.

13. In open chain compounds, Greek letters must be used to indicate the position of a substituent, the letter *a* being assigned to the first carbon atom in the formula, except in the case of CN and CO₂H, for example, CH₃·CH₂·CH₂·CH₂I *a*-iodobutane, CH₃·CH₂·CH₂·CN *a*-cyanopropane.

14. Isomeric open chain compounds are most conveniently represented as substitution derivatives of the longest carbon chain in the formula; for example,



should be termed *βγ*-dimethylpentane, not methylethylisopropylmethane, and $\text{CH}_3 \begin{array}{c} \text{CH}_3 \\ > \end{array} \text{CH} \cdot \text{CH} \begin{array}{c} \text{CH}_3 \\ < \end{array} \text{CO}_2\text{H}$ or CH₃·CHMe·CHMe·CO₂H should be termed *αβ*-dimethylbutyric acid, not *αββ*-trimethylpropionic, or *α*-methylisovaleric, or methylisopropylacetic acid.

15. Use names such as methane, ethane, &c., for the normal paraffins or hydrocarbons of the C_nH_{2n+2} series of the form CH₃·[CH₂]₅·CH₃, &c. Term the hydrocarbons C₂H₄ and C₂H₂ ethylene and acetylene respectively (not ethene and ethine). Homologues of the ethylene series are to be indicated by the suffix *-ene*, and those of the acetylene series, wherever possible, by *-inene*. Adopt the name allene for the hydrocarbon CH₂:C:CH₂.

16. Distinguish all hydroxyl derivatives of hydrocarbons by names ending in *ol*. Alcohols should be spoken of as mono-, di-, tri-, or n-hydric, according to the number of OH-groups. Compounds which are not alcohols, but for which names ending in *ol* have been used, are to be represented by names ending in *ole*, if a systematic name cannot be given, thus anisole not anisoil, indole not indol. Compounds such as MeONa, EtONa, &c., should be termed sodium methoxide, sodium ethoxide, &c.

17. The radicles indicated in the name of a compound are to be

given in the order fluoro-, chloro-, bromo-, iodo-, nitro-, nitroso-, amino-, imino-, cyano-, thiocyno-, hydroxy-.

18. Compounds analogous to the acids of the lactic series containing the OH-group should be termed *hydroxy*-derivatives, and not oxy-derivatives; for example, hydroxyacetic and not oxyacetic acid. Compounds containing the analogous groups OEt, OPh, OAc, &c., should in like manner be termed ethoxyl, phenoxyl, acetoxyl derivatives. Thus α -ethoxypropionic acid, $\text{OEt} \cdot \text{CHMe} \cdot \text{CO}_2\text{H}$, instead of ethyl-lactic acid; 3:4-diethoxybenzoic acid, $(\text{OEt})_2\text{C}_6\text{H}_3 \cdot \text{CO}_2\text{H}$, instead of diethylprotocatechuic acid; and α -acetoxypionic acid, $\text{OAc} \cdot \text{CHMe} \cdot \text{CO}_2\text{H}$, instead of acetyl-lactic acid. Terms such as diethylprotocatechuic acid should be understood to mean a compound formed by the displacement of hydrogen atoms in the hydrocarbon radicle of protocatechuic acid by ethyl, viz., $\text{C}_6\text{H}(\text{Et})_2(\text{OH})_2 \cdot \text{CO}_2\text{H}$, and not $\text{C}_6\text{H}_3(\text{OEt})_2 \cdot \text{CO}_2\text{H}$, just as dibromoprotocatechuic acid is understood to be the name of a compound of the formula $\text{C}_6\text{HBr}_2(\text{OH})_2 \cdot \text{CO}_2\text{H}$.

19. The term *ether* should be restricted to the oxides of hydrocarbon radicles and their derivatives, and the esters (so-called compound ethers or ethereal salts) should be represented by names similar to those given to metallic salts.

20. When a substituent is one of the groups NH_2 , NHR , NR_2 , NH or NR , its name should end in *ino*; for example, β -aminopropionic acid, $\text{NH}_2 \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{CO}_2\text{H}$, β -anilino-acrylic acid, $\text{NHPh} \cdot \text{CH} \cdot \text{CH} \cdot \text{CO}_2\text{H}$, α -iminopropionic acid, $\text{NH} \cdot \text{CMe} \cdot \text{CO}_2\text{H}$.

21. Compounds of the radicle SO_3H should, whenever possible, be termed sulphonic acids, or failing this, sulpho-compounds; for example, benzenesulphonic acid, sulphobenzoic acid.

22. Basic substances should invariably be indicated by names ending in *ine*, as aniline instead of anilin, the termination *in* being restricted to certain neutral compounds, viz., glycerides, glucosides, bitter principles, and proteids, such as palmitin, amygdalin, albumin. The compounds of basic substances with hydrogen chloride, bromide or iodide should always receive names ending in *ide* and not *ate*, as morphine hydrochloride and not morphine hydrochlorate.

23. The Collective Index, 2nd decade (1883—1892) should be adopted as the standard of reference on questions of nomenclature not provided for in the preceding sections.

Notation.

24. In empirical formulæ the elements are to be given in the order C, H, O, N, Cl, Br, I, F, S, P, and the remainder alphabetically.

25. Equations should be omitted unless essential to the understanding of the results; as a rule, they should not be written on a separate line, but should "run on" with the text.

26. To economise space, it is desirable:

- (a) That *dots* should be used instead of *dashes* in connecting contiguous symbols or radicles, whenever this does not interfere with the clearness of the formula.

(b) That formulæ should be shortened by the judicious employment of the symbols Me for CH_3 , Et for C_2H_5 , Pr^a for $\text{CH}_2\cdot\text{CH}_2\cdot\text{CH}_3$, Pr^b for $\text{CH}(\text{CH}_3)_2$, Ph for C_6H_5 , Py for $\text{C}_5\text{H}_4\text{N}$, Ac for $\text{CO}\cdot\text{CH}_3$, and Bz for $\text{CO}\cdot\text{C}_6\text{H}_5$.

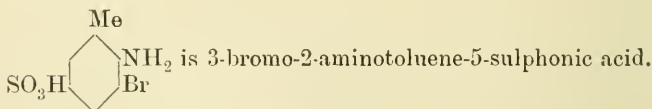
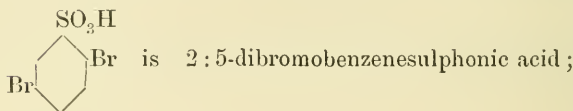
(c) That formulæ should be written *in one line* whenever this can be done without obscuring their meaning.

27. In representing the constitution of benzene derivatives, the relative positions of the radicles in the symbol of benzene should be indicated by numerals, instead of by means of the hexagon formula.

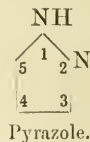
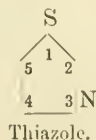
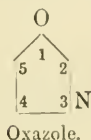
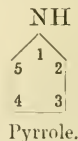
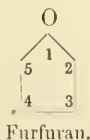
(a) The abbreviations *o*-, *m*-, and *p*-, should be used in place of 1 : 2- or ortho-, 1 : 3- or meta-, and 1 : 4- or para.

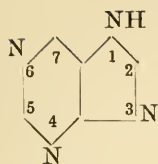
(b) In numbering positions in the case of substitution derivatives of phenol, aniline, benzonitrile, benzoic acid, benzenesulphonic acid, benzaldehyde, and toluene, the characteristic radicle of each of these parent substances is to be regarded as in position 1 (compare Collective Index).

(c) Names of substitution derivatives should be given in such a way that the position of the substituent is indicated by a numeral prefixed ; for example :—



28. In representing the constitution of derivatives of other "closed chain" hydrocarbons, graphic formulæ should not be employed, but the system of numbering positions indicated in Richter's *Lexikon der Kohlenstoff-Verbindungen* (2nd edition, 1899, pp. 16—26) should be used, of which the following schemes may be regarded as typical :—





Purine.



Pyridine.



Indole.



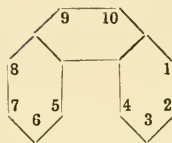
Naphthalene.



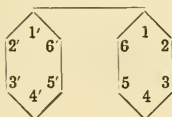
Quinoline.

*iso*-Quinoline.

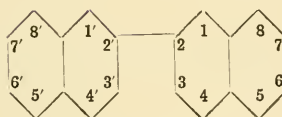
Anthracene.



Phenanthrene.



Diphenyl.

 $\beta\beta$ -Dinaphthyl.

Manuscript.

29. In view of the difficulty of dealing with MSS. of widely varying sizes, abstracts cannot be accepted unless written on quarto paper (10 \times 8 in.).

30. Not more than one abstract must appear on a sheet.

31. When an abstract exceeds a sheet in length, the sheets must be fastened together by means of gum at the top left-hand corner.

32. The name of the abstractor must be written diagonally at the top left-hand corner of the first sheet of the abstract.

Proofs.

33. Abstractors are expected to read and correct proofs carefully, and to check all formulæ and figures against MSS.

34. All proofs, however small, must be returned to the Sub-Editor not later than 24 hours after receipt from the printers.

* * * The Editor's decision, in all matters connected with the Abstracts, must be considered final.

JOURNALS FROM WHICH ABSTRACTS ARE MADE.

All references to Journals should give the abbreviated title, the year of publication the series, the volume and the page ; thus *Ber.* 1901, **34**, 2455 ; *Bull. Soc. chim.* 1901, [iii], **25**, 794 ; *Gazzetta* 1901, **31**, i, 554.

ABBREVIATED TITLE.	JOURNAL.
<i>Amer. Chem. J.</i> . . .	American Chemical Journal.
<i>Amer. J. Pharm.</i> . . .	American Journal of Pharmacy.
<i>Amer. J. Sci.</i> . . .	American Journal of Science.
<i>Analyst</i>	The Analyst.
<i>Annalen</i>	Justus Liebig's Annalen der Chemie.
<i>Ann. Physik</i>	Annalen der Physik.
<i>Ann. Agron.</i>	Annales agronomiques.
<i>Ann. Chim. anal.</i> . . .	Annales de Chimie analytique appliquée à l'Industrie, à l'Agriculture, à la Pharmacie et à la Biologie.
<i>Ann. Chim. Phys.</i> . . .	Annales de Chimie et de Physique.
<i>Ann. Inst. Pasteur</i> . . .	Annales de l'Institut Pasteur.
<i>Ann. sci. Univ. Jassy</i> . .	Annales scientifiques de l'Université de Jassy.
<i>Arch. Hygiene</i>	Archiv für Hygiene.
<i>Arch. Néerland.</i>	Archives Néerlandaises des sciences exactes et naturelles.
<i>Arch. Pharm.</i>	Archiv der Pharmazie.
<i>Arch. Sci. phys. nat.</i> . .	Archives des Sciences physiques et naturelles.
<i>Atti R. Accad. Sci. Torino.</i>	Atti delle Reale Accademia delle Scienze di Torino.
<i>Atti R. Accad. Lincei</i> . .	Atti della Reale Accademia dei Lincei.
<i>Beitr. chem. Physiol. Pathl.</i>	Beiträge für chemische Physiologie und Pathologie.
<i>Ber.</i>	Berichte der Deutschen chemischen Gesellschaft.
* <i>Bied. Centr.</i>	Biedermann's Centralblatt für Agrikulturchemie und rationalen Landwirtschafts-Betrieb.
<i>Bihang K. Svenska Vet.- Akad. Handl.</i>	Bihang till Kongl. Svenska Vetenskaps-Akademiens Handlingar.
<i>Bull. Acad. roy. Belg.</i> . .	Académie royale de Belgique—Bulletin de la Classe des Sciences.
<i>Bull. Acad. Sci. Cracow</i> . .	Bulletin international de l'Académie des Sciences de Cracovie.
<i>Bull. Coll. Agr. Tōkyō</i> . .	Bulletin of the College of Agriculture, Imperial Uni- versity, Tōkyō.
<i>Bull. Geol. Soc. Amer.</i> . .	Bulletin of the Geological Society of America.
<i>Bull. Soc. chim.</i>	Bulletin de la Société chimique de Paris.
<i>Bull. Soc. franç. Min.</i> . .	Bulletin de la Société française de Minéralogie.
<i>Bull. Soc. ind. Mulhouse</i> . .	Bulletin de la Société industrielle de Mulhouse.
<i>Centr. Bakt. Par.</i>	Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten.
<i>Centr. Min.</i>	Centralblatt für Mineralogie, Geologie und Palaeontolo- gie.
* <i>Chem. Centr.</i>	Chemisches Centralblatt.
<i>Chem. News</i>	Chemical News.

* Abstracts from the *Centralblatt* are made only in the case of papers published in journals other than those included in this list.

JOURNAL

OF

THE CHEMICAL SOCIETY.

ABSTRACTS OF CHEMICAL PAPERS PUBLISHED IN
BRITISH AND FOREIGN JOURNALS.

PART II.

General and Physical Chemistry.

Refractive Index and Dispersion of Bromine. By CHARLES RIVIÈRE (*Compt. rend.*, 1900, 131, 671—672).—The author has determined the refractive index of bromine by means of the Fizeau-Foucault fringes for wave-lengths between 7909 and 5390, and at temperatures from 10° to 25°. The refractive index for the line *A* is 1.6394 at 10° and 1.6305 at 20°, and for the line *D*₂ 1.6543 at 20°. At 20° the dispersion between *A* and *D* is 0.037, which is greater even than that of carbon disulphide. C. H. B.

Contributions to the Theory of Photographic Development. By J. PRECHT (*Chem. Centr.*, 1900, ii, 617; from *Arch. wiss. Phot.*, 2, 155—157).—The author considers that Luther's experimental results (*Abstr.*, 1900, ii, 253) are equally well explained by the assumption of the formation of the compound $\text{Ag}_2\text{O}, 2\text{AgCl}$, and do not prove the formation of a subchloride. L. M. J.

Researches on the Silver Germ Action in Development. By J. PRECHT and WILHELM STRECKER (*Chem. Centr.*, 1900, ii, 617—618; from *Arch. wiss. Phot.*, 2, 158—164).—Against the views of Ostwald and Abegg (*Abstr.*, 1900, ii, 253) the authors urge the following objections. The impossibility of developing under-exposed images completely through the film; the slowness of the lateral broadening of the illuminated parts; the impossibility of increasing a thin veil to a reasonable density. These objections do not apply to the authors' theory that the silver bromide is altered, it may be but

physically, by the light so as to be rendered capable of reduction by the developer. A plate was covered by a thin emulsion and then one half coated by a similar emulsion; it was exposed and after exposure the single coating received a second emulsion. On development, it was found that the original double layer gave the denser image. The authors consider that this supports their views, as according to the silver germ theory the two halves should be of equal density.

L. M. J.

Electrode Potentials. By N. T. M. WILSMORE (*Zeit. physikal. Chem.*, 1900, 35, 291—332).—The expression $RT/n \cdot \log_e P$, where P is the electrolytic solution pressure, or more generally, an integration constant, is termed 'electrolytic potential,' and the relative values of this expression are given for 31 elements. The solutions in contact with the electrodes are supposed to be of normal ionic concentration, and the electrolytic potential of the hydrogen electrode is taken as zero. The results of earlier workers, as well as those of the author himself, are incorporated in the calculations. The hydrogen electrode has been fully investigated, and a form suitable as a normal electrode is described. On the basis of this new standard, the normal calomel electrode has the potential -0.283 volt. In the course of the experiments it was found that the E.M.F. of the hydrogen-oxygen gas cell slowly rises, and with normal sulphuric acid as electrolyte reaches the constant value 1.119 volt in 4—6 days.

The behaviour of air—and various metallic electrodes has been investigated from the point of view of their serviceableness as normal electrodes. With acid electrolytes, platinum points previously subjected to cathode polarisation, are found to be serviceable standard electrodes, inferior perhaps to mercury and lead, but preferable to zinc and cadmium electrodes immersed in solutions of their salts. With alkaline electrolytes, the only approximately satisfactory electrode is $\text{Hg} | \text{Hg}_2\text{O}$.

J. C. P.

Absolute Potentials of the Metals and Remarks on Normal Electrodes. By WILHELM OSTWALD (*Zeit. physikal. Chem.*, 1900, 35, 333—339).—The author criticises the introduction of the hydrogen electrode as a normal electrode (see Wilsmore, preceding abstract), and points out the advantages possessed by the older normal calomel electrode— $N/10 \text{ KCl, Hg}_2\text{Cl}_2 | \text{Hg}$. A table is added giving Wilsmore's values in absolute potentials, the difference between the normal hydrogen and calomel electrodes being taken as 0.283 volt—the value given by that author.

J. C. P.

Chemical Actions Caused by the Silent Electric Discharge and the Conditions under which they take place. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1900, 131, 772—781. Compare Abstr., 1878, 371).—A review of the chemical changes caused by the silent electric discharge and the effect of varying the potential between the two surfaces bounding the dielectric.

The potential of the atmosphere on a calm day, at an altitude of 28 m. is from 600—800 volts above that of the earth's surface, which is of course zero, and this difference of potential increases by about 20—30 volts for an increase in height of 1 m. This difference of

potential between different layers of air, or between the earth and the air above it, produces a silent electric discharge, the effects of which are in every way analogous to those produced in an ordinary ozoniser, and may account for the presence of ozone, oxides of nitrogen, ammonium nitrate, &c., in the atmosphere.

The formation of nitric acid when hydrogen, sulphur, &c., burn in air, and the changes which take place when a gas is heated to a high temperature and then allowed to come in contact with a cold surface, may be due to the silent electric discharge, the production of which is explained thus: electrification is developed in a gas which is at a high temperature, more especially if the temperature is not uniform throughout the whole mass of the gas. Now when a portion of such a gas is cooled by a cold surface, the layer of gas which is in direct contact with the cold surface is practically a dielectric, since it is necessarily at a low temperature, whereas the layers of gas above it, which are at a high temperature, possess a certain electrical conductivity. A silent electric discharge will therefore take place between the layers at a high temperature and the cold surface introduced, this discharge taking place through the cooled layer of gas directly in contact with the cold surface.

H. R. LE S.

Diffusion of Ions Produced in Air by the Action of a Radio-active Substance, Ultra-violet Light, and Point Discharges. By JOHN S. TOWNSEND (*Proc. Roy. Soc.*, 1900, 67, 122—124).—The diffusion coefficient was calculated from observations on the loss of conductivity of the gas as it passes along metal tubing. It was found that the negative ions produced when ultra-violet rays fall on zinc, diffuse into air at the same rate as the negative ions produced by a radio-active substance, the values of the coefficient being 0.0435 and 0.0375 cm.²/second in dry and moist air respectively at 17°. The ions produced by point discharges varied considerably, the negative ions have a diffusion coefficient in dry air varying from 0.037—0.032, that of the positive ions varying from 0.0247 to 0.0216; the values in moist air are slightly higher.

L. M. J.

Electro-striction of Ions in Organic Solvents. By GIACOMO CARRARA and M. G. LEVI (*Gazzetta*, 1900, 30, ii, 197—217).—The molecular volumes of several electrolytes and non-electrolytes in solution in organic solvents and in water have been measured for various concentrations, the results being calculated by the formula $\phi = A/Q - 1000 (S/Q - 1)/m$, where ϕ is the molecular volume of the solute in the solution, A its equivalent weight, Q the sp. gr. of the solvent (at 25°/4°), S the sp. gr. of the solution, and m the number of gram-molecules of solute in a litre of solution. The results agree in general, although there are exceptions, with the electro-striction theory of Drude and Nernst (*Zeit. physikal. Chem.*, 1894, 15, 79), the diminution of ϕ as the dilution increases being great or small according as the change in degree of dissociation is great or small. Also the smaller the dissociation in solution, the more nearly do the values of ϕ agree with those of the molecular volumes of the dissolved substances. The following table is for methyl alcoholic solutions, V being the dilution.

	Molecular volume.	ϕ .	V .
Naphthalene.....	111.79	116.88	4.097
Carbamide	45.18	37.76	0.945
Cadmium iodide ...	122.40	126.29	1.637
„	—	121.67	13.096

The results for trichloroacetic acid in various solvents are as follows :

	Molecular volume.	ϕ .	V .
Methyl alcohol.....	101.11	96.69	3.252
Ethyl alcohol	101.11	92.59	1.94
Acetone	101.11	94.76	3.252
Water	101.11	85.44	3.77

T. H. P.

Electromotive Force and Osmotic Pressure. By R. A. LEHFELDT (*Zeit. physikal. Chem.*, 1900, 35, 257—282).—By means of a reversible cycle process, an expression is deduced for the E.M.F. of a concentration cell of the type:—metal | dilute salt solution | concentrated salt solution | metal. From the formula, which is applicable both to dilute and concentrated solutions, it follows that the E.M.F. of such a cell depends on the total osmotic pressure of the salt, and not on that of the metallic ions only. Experiments are described in which the E.M.F.s of concentration cells containing zinc chloride and sulphate have been determined. From the numbers thus obtained, and those given by other workers, the osmotic pressures in concentrated solutions of zinc chloride and sulphate have been calculated with the formula referred to. When P is the osmotic pressure, and V the volume which contains 1 gram equivalent, the expression PV/i should be constant in so far as the gaseous laws are exactly applicable. With increasing concentration, the value of PV/i for zinc chloride rises from the first, whilst in the case of zinc sulphate it first diminishes, reaches a minimum, and then steadily increases.

When the potential difference between metal and electrolyte is regarded as proportional to $\int PdV$, the electrolytic solution pressure of zinc must have the enormous value of 10^{19} atmospheres. The author points out that if the potential difference is made proportional to $\int VdP$, the electrolytic solution pressure of zinc has quite a moderate value—about 20,000 atmospheres (compare Abstr., 1900, ii, 62).

J. C. P.

Study of Hydrolytic Dissociation by means of Electrical Conductivity. By ROBERTO SALVADORI (*Atti Real. Accad. Lincei*, 1900, [v], 9, ii, 177—180).—The electrical conductivities of dilute solutions of various salts, which in aqueous solution are hydrolytically dissociated, have been measured (1) alone and (2) in presence of added acid or base. In the latter case, hydrolytic dissociation is prevented, so that the electrical conductivity is that due only to electrolytic dissociation, which is diminished in degree by the addition of the acid or base. The salts examined were potassium carbonate in water and in $N/100$ potassium hydroxide solution and barium, copper, and lead

nitrate in water, and in $N/100$ nitric acid. In the case of the potassium carbonate, the difference between the two conductivities increases very considerably with the dilution, indicating a large increase in the hydrolysis. With copper nitrate, the differences found for the more concentrated solutions are the same as those for corresponding solutions of the non-hydrolysed barium nitrate, so that copper nitrate does not undergo appreciable hydrolysis in concentrated solution; only in very dilute solutions is the difference for barium nitrate less than that for copper nitrate, which hence only suffers slight hydrolysis in dilute solutions. For lead nitrate, the differences in conductivity show a decided increase as the dilution becomes greater, but even in the most dilute solutions the numbers are smaller than those for barium nitrate.

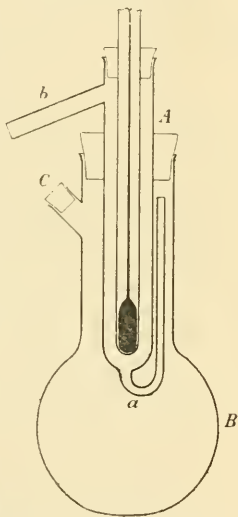
T. H. P.

Electrolytic Solution Pressure. By R. A. LEHFELDT (*Zeit. physikal. Chem.*, 1900, 35, 369).—A reply to Krüger's criticism (*Abstr.*, 1900, ii, 706).

J. C. P.

New Method for the Exact Determination of the Boiling Point. By A. SMITS (*Proc. K. Akad. Wetensch. Amsterdam*, 1900, 3, 86—91).—The apparatus used in this modification of Landsberger's method (*Abstr.*, 1898, ii, 283) resembles that described by McCoy (*Abstr.*, 1900, ii, 387), but differs from it in that the vapour of the boiling solvent from the flask *B* passes through the tube *a* sealed in the bottom of the inner boiling tube *A*, which contains the solution. The variation in the thermometer reading due to variation in the rate of passage of the vapour is prevented by introducing a cylinder of platinum gauze into the boiling tube *A*. The author considers that, if the apparatus is carefully used, and the errors due to slight changes in the atmospheric pressure are eliminated by having for comparison a similar vessel filled with water, the results are more accurate than those obtained with Beckmann's apparatus.

J. C. P.



Magnetic Rotation of the Plane of Polarisation in Liquefied Gases under Atmospheric Pressure. I. By L. H. SIERTSEMA

(*Proc. K. Akad. Wetensch. Amsterdam*, 1900, 3, 70—74).—The author sketches and describes an apparatus used to determine magnetic rotation in liquefied gases. From preliminary experiments with methyl chloride, it is shown that the dispersion is about the same as for most gases. In the following table, w/w_D is the ratio of the rotation to that for sodium light.

λ .	w/w_D (CH_3Cl).	w/w_D (gases).
0.631	0.90	0.87
0.546	1.17	1.17
0.480	1.58	1.53
0.449	1.76	1.76
0.435	1.90	1.90

J. C. P.

Acetals of Monohydric Alcohols. By MARCEL DELÉPINE (*Compt. rend.*, 1900, 131, 684—686).—The following results were obtained,

	Heat of combustion. 1 gram.	Molecular heat of combustion.		Heat of formation.
		Const. vol.	Const. press.	
Diethylformal ...	7429·1 cal.	772·62 Cal.	773·75 Cal.	111·75 Cal.
Dipropylformal.,	8205·1	1083·07	1084·8	127·3
Diisobutylformal	8697·4	1391·57	1393·85	144·85
Diisoamylformal.	9064·5	1704·12	1707·0	158·3
Dimethylacetal...	6873·3	619·0	* 619·9	102·3
Diethylacetal ...	7872·2	928·9	930·35	118·45

The difference between two consecutive homologues is practically constant and is 155—156 Cal., although the deviations from this value are a little greater with the acetals than with the formals. The heat of formation of acetals and formals from alcohols and acetaldehyde and formaldehyde respectively is very small, but seems to increase with the molecular weight of the alcohols. C. H. B.

Thermochemical Researches on the Principal Opium Alkaloids. By ÉMILE LEROY (*Ann. Chim. Phys.*, 1900, [vii], 21, 87—144).—A detailed account of work already published (compare Abstr., 1899, ii, 465, 631; 1900, ii, 261). G. T. M.

Berthier's Method for Determining the Calorific Value of Fuels. By UBALDO ANTONY and E. DI NOLA (*Gazzetta*, 1900, 30, ii, 218—224).—Two common objections to Berthier's method of measuring the calorific value of fuels, in which the lead obtained on heating the fuel with litharge is weighed, are (1) that volatile products are evolved at temperatures lower than that at which reduction of the litharge takes place, and (2) that the heats of combustion of the different elements of the fuel are not proportional to the amounts of oxygen which they take up on burning. From a number of trials with different kinds of coal, the authors conclude that, if care is taken to heat the mixture of fuel and litharge slowly, reduction of the latter occurs without the evolution of any volatile matter. In the case of ordinary fuels, the error introduced into the calculation of calorific power by assuming that all the lead obtained is due to carbon, is very small and may be neglected. The available hydrogen in a fuel may be measured by heating it in a graphite crucible with lead fluoride, the reduction of which to metal is due entirely to the hydrogen. If p_c is quantity of lead obtained by the reduction of litharge, and p_H that formed from the fluoride, the calorific power of the fuel is given by the formula :

$$P = \frac{p_c}{34\cdot5} \times 8083 + \frac{p_H}{103\cdot5} \times 29367 \text{ (calories).}$$

T. H. P.

Vapour Pressure of Binary Liquid Mixtures. By JAN VON ZAWIDZKI (*Zeit. physikal. Chem.*, 1900, 35, 129—203).—The author has determined by means of apparatus described in the paper, the vapour pressure at certain temperatures in the case of a number of binary liquid mixtures, the composition being varied from 0 : 1 to 1 : 0.

The composition of the distillate being determined from its refractive index, the partial pressures in each mixture were calculated. The mixtures examined were benzene and carbon tetrachloride, benzene and ethylene dichloride, carbon tetrachloride and ethyl acetate, carbon tetrachloride and ethyl iodide, ethyl acetate and benzene, acetic acid and benzene, acetic acid and toluene, acetic acid and pyridine, pyridine and water, carbon disulphide and methylal, acetone and carbon disulphide, chloroform and acetone, ethylene dibromide and propylene dibromide. Margules has deduced the relation $d\log p_1/d\log x = d\log p_2/d\log (1-x)$, where p_1 and p_2 are the partial pressures, and x the concentration of liquid (1); for integration, the connection between p_1 and x is required, and the author employed the relation $p_1 = P_1 x e^{a/2(1-x)^2 + b/3(1-x)^3}$ with a corresponding value for p_2 , P_1 being the vapour pressure of liquid (1). The values of p_1 and p_2 are so calculated, the constants a and b being obtained either from observations of the partial pressures of mixtures, or from the tangential values of the curve at the percentages 0 and 100. The calculated values so obtained are found to agree well with the observations, not only for mixtures of liquids of normal vapour density, but also for liquids of abnormal vapour density, and for mixtures in which chemical combination probably takes place.

L. M. J.

Vapour Pressure Relations in Mixtures of Two Liquids. III.

By A. ERNEST TAYLOR (*J. Physical Chem.*, 1900, 4, 675—689).—The author employs his previously recorded determinations (Abstr., 1900, ii, 529) for the purpose of testing the validity of the van't Hoff-Raoult formula for the partial pressures in a mixture. The formula may be written $\log p/p_1 = c_2/c_1$, where p is the vapour pressure of one constituent, p_1 its partial pressure in the mixture in which its concentration is c_1 , c_2 being the concentration of the second component. The author finds that the partial pressure of acetone in mixtures of acetone and water is fairly well given by this expression if the concentration does not exceed 60 per cent., but that it does not hold for the partial pressure of the water. The author does not attempt to test Margules' expression, which has been found by Zawidzki to accurately yield the partial pressures in binary mixtures (preceding abstract).

L. M. J.

Influence of Neutral Salts on the Tension of Ammonia in Aqueous Solutions. By W. GAUS (*Zeit. anorg. Chem.*, 1900, 25, 236—264).—The tendency of a substance to form complex compounds may be regarded as a measure of its electro-affinity (Abegg and Bodlander, Abstr., 1899, ii, 542). The author has therefore investigated the tendency of normal salts to form complex ammoniacal compounds, this being determined by the decrease of tension of ammonia in the aqueous solution, consequent on the addition of the normal salt. The vapour tension was measured in a manner essentially similar to that described by Gahl (Abstr., 1900, ii, 389). For small tensions, it was found that the tension of ammonia was proportional to the concentration, and that between 23° and 27° the temperature coefficient could be regarded as linear. Various salts were added to the solution; it was found that sodium hydroxide and most

ammonium salts caused, as expected, an increase of tension, sodium and potassium chlorides also causing an increase. Ammonium nitrate, iodide, and thiocyanate, however, bring about a decrease of tension, the cause of this not being apparent, unless complex compounds are formed. All the other salts examined produced a decrease, which was most marked in the case of cupric and silver salts. Qualitatively, the results appear in accord with theory, but more extended data are necessary before the quantitative relations can be profitably discussed.

L. M. J.

Diagram of Freezing Point Depressions for Electrolytes. By JAMES G. MACGREGOR (*Trans. Nova Scot. Inst. Sci.*, 1900, 10, 211—235).—If α is the ionisation coefficient, and κ the depression constant, for an electrolyte whose molecule, as it exists in very dilute solution, contains p equivalents and dissociates into q free ions, then δ (equivalent depression) $= \kappa/p.[1 + \alpha(q - 1)]$. If for various electrolytes equivalent depressions are plotted against ionisation coefficients, the resulting curves must, at extreme dilution ($\alpha = 1$), be tangential to the straight lines represented by the above equation, provided the proper values of κ , p , and q have been employed. A number of such curves have been drawn, based on the freezing point work of Arrhenius, Raoult, Loomis, Jones, Abegg, Wildermann, Ponsot, Archibald, and Barnes, and the determinations of ionisation coefficients at 0° due to Archibald, Barnes, Déguisne, and Whetham. The author concludes that the curves have positions, forms, and slopes such as they might be expected to have on reasonable assumptions as to mode of ionisation and constitution in solution, according to the van't Hoff-Arrhenius theory of the depression of the freezing point in electrolytic solutions. For all the electrolytes examined, the curves are consistent with the value 1.85 for the depression constant; in the case of potassium chloride, for which the best data are obtainable, the curve is not consistent with a greater limit of error than 0.01 in the value of the depression constant, unless improbable assumptions are made regarding the constitution of the electrolyte in solution.

J. C. P.

Distinction between Physical and Chemical Supersaturation of Liquids by Gases. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1900, 131, 637—646).—The author applies the calorimeter to distinguish between those cases in which an abnormal quantity of gas is retained in a liquid by physical causes, and those in which the retention is due to the formation of some unstable compound. In the former case, the liberation of the excess of gas is always accompanied by a fall in the temperature of the liquid; in the latter there is, as a rule, a rise of temperature, because the unstable compounds in question are usually endothermic. The rise of temperature is observed in the decomposition of hydrogen peroxide in contact with spongy platinum, and in the reaction between hydrogen peroxide, potassium permanganate, and sulphuric acid, which with special precautions can be mixed so that very little oxygen is liberated, although the liquid becomes quite colourless. The retention of the oxygen in these cases is probably due to the formation of a hydrogen peroxide containing a higher proportion of oxygen than the dioxide.

C. H. B.

Viscosity of Gases as affected by Temperature. By LORD RAYLEIGH (*Proc. Roy. Soc.*, 1900, 67, 137—139).—A continuation of the author's previous paper (Abstr., 1900, ii, 590), the gas examined being the residue from gases collected at the Bath springs, which was uncondensed by liquid hydrogen. It consisted chiefly of helium with, probably, some neon. The variation of viscosity between 100° and the ordinary temperature was the same as for hydrogen, so that the value of η (*loc. cit.*) is 0.681 as for hydrogen. Sutherland has deduced theoretically the expression $\theta^{\frac{1}{2}}/(1 + c/\theta)$ as the function of temperature to which viscosity is proportional. The values of c obtained on the assumption of this expression are air, 111.3; oxygen, 128.2; helium and hydrogen, 72.2; argon, 150.2; the values for air and oxygen agree well with the values calculated by Sutherland from previous observations.

L. M. J.

Diffusion of Gold in Solid Lead at the Ordinary Temperature. By SIR W. C. ROBERTS-AUSTEN (*Proc. Roy. Soc.*, 1900, 67, 101—105).—The author has previously shown that gold diffuses into lead at a temperature considerably below the melting point of the latter (Abstr., 1896, ii, 590). The experiments have now been extended to ordinary temperatures. Cylinders of solid lead with discs of solid gold affixed to their bases were kept for four years in a cellar at a temperature of about 18°. It was found that gold had diffused upwards, the concentration in the lowest layer of 0.75 mm. was about 1 oz. 6 dwt. per ton, and in a slice at a distance of over 7 mm. from the base gold was detected, the concentration being $1\frac{1}{2}$ dwt. per ton. The great increase of diffusion with temperature is apparent from the fact that the rate here calculated is about 1/350,000 of that in molten lead. Experiments to test whether the diffusion is accelerated by the passage of an electric current have not yet led to conclusive results.

L. M. J.

Composition of the Vapour Phase in the System Water-Phenol, with One and Two Liquid Phases. By FRANS A. H. SCHREINEMAKERS (*Proc. K. Akad. Wetensch. Amsterdam*, 1900, 3, 1—11).—In the three-phase system water—phenol, the percentage of phenol in the vapour phase increases with rising temperature, and between 30° and 65° is less than that in either of the two liquid phases at the same temperature. [For the composition of the liquid phases compare Rothmund, Abstr., 1898, ii, 503.]

The author has investigated also the system with one liquid and one vapour phase, at the temperatures 56.3°, 75°, and 90°. At each temperature, a liquid containing a small quantity of phenol yields a vapour containing more, and one with much phenol yields a vapour containing less, phenol than itself. The vapour pressure and the amount of phenol in the vapour vary but slightly, while the composition of the liquid varies between wide limits. At each temperature, there is one mixture which is in equilibrium with a vapour of its own composition, and consequently has a maximum vapour pressure; the higher the temperature, the greater the proportion of phenol in this mixture.

The results are in agreement with the formula of van der Waals, $dP/dx_1 = P(x_1 - x_2)/[x_1(1 - x_1)]$, where P is the vapour pressure, x_1 and

x_2 the number of phenol molecules to 1 water molecule in the vapour and liquid respectively. J. C. P.

A New Conception of Thermal Pressure and a Theory of Solution. By G. N. LEWIS (*Zeit. physikal. Chem.*, 1900, 35, 343—368).—When two phases of a substance are in equilibrium, and the pressure on the one phase is increased, the pressure on the other phase must also be increased, if equilibrium is to be preserved; if dP_1 and dP_2 be these corresponding increments, then $dP_1/dP_2 = \sigma_2/\sigma_1$, where σ_1 and σ_2 are the specific volumes of the two phases. If ice and water are in equilibrium at atmospheric pressure, and the external pressure on the ice is increased by 1 atmosphere, equilibrium can only be maintained by an additional pressure of 1.09 atmospheres on the water, the ratio of the specific volumes of ice and water being 1.09. If each particle of a phase is regarded as having a tendency (expressed by the function ψ) to pass over into another phase, then the increase in ψ accompanying an increase in the external pressure P is proportional to the specific volume σ of the phase: or $d\psi/dP = K\sigma$. When β is the thermal pressure in the interior of a phase, and a is the resultant of all attractions or repulsions within the phase $P = \beta - a$, so that $d\psi/d(\beta - a) = K\sigma$. Hence the quantity ψ is affected only by a change in the difference $\beta - a$, not necessarily by a change in the absolute values of β and a . For a liquid or solid in contact with its vapour, and under the condition that the vapour behaves as a perfect gas, the author deduces the equation $dP_1/P_1 = d(\beta_2 - a_2)/(RT/v_2)$, where P_1 is the pressure of the vapour and v_2 the molecular volume in the liquid or solid phase; this means that the ratio of the change in vapour pressure to the total vapour pressure is the ratio of the change in external pressure to the pressure that would be exerted by the liquid or solid phase as a perfect gas. The author makes the supposition that the thermal pressure of a phase is equal to the pressure which the substance would exert if it existed under the same conditions as a perfect gas—that is, $\beta = nRT/V$, where n is the number of gram-molecules and V is the total volume. Further, all substances at the same temperature and under equal thermal pressure contain the same number of molecules in unit volume.

The author applies similar reasoning to the case of solutions, and shows that the above supposition is capable of interpreting the laws which hold in dilute solutions. Other consequences of the theory are discussed, particularly its relation to the theory of van der Waals.

J. C. P.

Velocity of Solution of Solid Substances. By LUDWIK BRUNER and STANISLAW TOLLOCZKO (*Zeit. physikal. Chem.*, 1900, 35, 283—290).—The authors have somewhat modified Noyes and Whitney's method (*Abstr.*, 1897, ii, 479), and worked with a number of other substances—benzoic acid, phenylacetic acid, phenylpropionic acid, acetanilide, and gypsum. A known amount of each, having been fused and cast in a regular shape, was rotated in water kept at a constant temperature, the rotation being sufficiently rapid to ensure the solution being uniform throughout. The results are in good agreement with the equation $dx/dt = K(C - x)$, where C is the concentration of the satu-

rated solution, x the concentration at time t , and K a velocity constant. The authors record the value of K/F , where F is the surface of the solid exposed to the solvent. These constants are diffusion coefficients, for the solid may be regarded as coated with a layer of saturated solution, and the whole process consists in a diffusion from this saturated solution to the surrounding unsaturated solution. The authors' arrangement is therefore a method of determining diffusion coefficients.

J. C. P.

Solid Solutions in Mixtures of Three Substances. By GIUSEPPE BRUNI (*Atti Real. Accad. Lincei*, 1900, [v], 9, ii, 232—241).—Ternary mixtures are divided into the following six classes, conditioned by the capacity of the three components of forming solid solutions among themselves. (1) Two of the compounds, A and B are isomorphous, but C is not isomorphous with nor does it combine with either of the other two; (2) A and B are isomorphous, and each is capable of combining with C ; (3) A and B are isomorphous, and B alone combines with C ; (4) A is isomorphous with both B and C , but the two latter neither form a solid solution nor combine; (5) A is isomorphous with both B and C , and the two latter combine with one another; (6) the three components are all isomorphous. Triangular diagrams are given showing the saturation curves for the various cases.

T. H. P.

Inorganic Solvents and Dissociation Media. By PAUL WALDEN (*Zeit. anorg. Chem.*, 1900, 25, 209—226).—The author has investigated the solvent properties of a number of inorganic compounds, the dissociation in the solutions being determined by the conductivity method. Phosphorus trichloride and phosphorus tribromide are solvents for many organic compounds, and for the halogen compounds of arsenic, antimony, and tin, but most inorganic salts are insoluble in these liquids and no dissociation occurs. Phosphorus oxychloride dissolves many metallic salts and acids as well as organic compounds; binary salts undergo considerable dissociation, but tertiary salts and acids are only slightly dissociated. Arsenic trichloride is a good solvent for many salts, and also causes dissociation of binary salts. Sulphuryl chloride, SO_2Cl_2 , has slight dissociative power, which is, however, more marked in thionyl chloride, SOCl_2 , whilst sulphur dichloride, S_2Cl_2 , although a good solvent for many salts, causes practically no dissociation. Sulphur trioxide has no dissociative power, this result being interesting inasmuch as sulphur dioxide has been found to yield conducting solutions (Walden, *Abstr.*, 1900, ii, 10). Silicon tetrachloride and stannic chlorides are not good solvents and cause no dissociation; antimony pentachloride has no dissociative power, but antimony trichloride yields conducting solutions, a result in accord with the observations of Tolloczko (*Abstr.*, 1900, ii, 190). Bromine and boron trichloride have slight solvent, but no dissociative, power. The results appear to show that dissociative power cannot be ascribed to unsaturation, but is a specific property of the solvent, and it is noteworthy that all the dissociative solvents belong to the nitrogen or oxygen families.

L. M. J.

Solubility of Manganous Sulphate. By F. G. COTTRELL (*J. Physical Chem.*, 1900, 4, 637—656).—The solubility curves for the various hydrates of manganous sulphate were determined; the results as a whole are lower than those of Linebarger (*Abstr.*, 1893, ii, 417), a result probably due to inaccuracies in the latter's determinations. The author succeeded in preparing only the mono-, tetra-, penta-, and hepta-hydrates, but does not dispute the existence of the other hydrates found by Linebarger and others. The experimental methods, results, and the solubility curves are given; the latter indicate that from -10° to about $+8^{\circ}$ the heptahydrate is the stable form, the solubility increasing from about 48 parts to about 59 parts anhydrous salt per 100 parts of water. From about 8° to about 27° the pentahydrate is the stable form, the solubility increasing to about 66 parts per 100 of water; above 27° , the monohydrate is stable with a decreasing solubility curve. The tetrahydrate is not stable over any temperature range, its solubility curve cutting that of the heptahydrate at about 14° , and passing through the point of intersection of the curves for the monohydrate and pentahydrate. In each case, a considerable part of the labile portion of the curve was also determined. Incidentally, the author finds that a temperature of 170° is not sufficient to expel the last molecule of water from manganous sulphate; this occurs at 250° , and the salt may be heated to 300° without any decomposition.

L. M. J.

Soap Solutions. By A. SMITS (*Proc. K. Akad. Wetensch. Amsterdam*, 1900, 3, 133—137).—Combination of the boiling point and vapour tension methods shows that solutions of sodium palmitate with less than 1 gram-molecule per 1000 grams of water cause an elevation of the boiling point and a decrease in the vapour tension, which starting from the concentration 0 must reach a maximum, to again become 0 at about a concentration of 1 gram-mol. per 1000 grams of water. This progressive change may be due to the part played by hydrolytic dissociation. A concentrated solution of sodium palmitate has the boiling point and vapour tension of pure water, so it is probably colloidal. Kahlenberg and Schreiner found that both dilute and concentrated soap solutions are good electric conductors. In the light of the author's experiments, this should be the case for dilute, but not for concentrated solutions (compare Krafft, *Abstr.*, 1899, ii, 470; Kahlenberg and Schreiner, *Abstr.*, 1899, ii, 202).

J. C. P.

Hydration of Dissolved Substances. By WALTHER NERNST (*Chem. Centr.*, 1900, ii, 619; from *Nachr. k. Ges. Wiss. Göttingen*, 1900, 68—69).—Equilibrium in dilute solutions is independent of hydration, and no decision regarding the existence of hydrates can be obtained from observations thereon. Experiments on diffusion and on transference ratios should, however, give indications of hydration, and from the results of Lotmar, and of Garrard and Oppermann (following abstracts), the author concludes that hydrates are either non-existent, or present in only insignificant quantities.

L. M. J.

Hydration of Dissolved Substances. By H. LOTMAR (*Chem. Centr.*, 1900, ii, 619—620; from *Nachr. k. Ges. Wiss. Göttingen*, 1900, 70—85).—Experiments were made on the diffusion of silver nitrate,

and boric, butyric, and acetic acids in aqueous solution. It was found that the carriage of water with the dissolved substance was more than compensated by the opposing diffusion of water. L. M. J.

Hydration of Dissolved Substances. By C. C. GARRARD and E. OPPERMAN (Chem. Centr., 1900, ii, 620; from *Nachr. k. Ges. Wiss. Göttingen*, 1900, 86—89).—The transference numbers were determined for hydrogen chloride, bromide, nitrate, and sulphate. Indications of migration of water with the anion were found, and on the assumption that the hydrogen ions are uncombined with water, the hydration of the anions is calculated, the compositions so obtained being $\text{NO}_3 \cdot 2\frac{1}{2}\text{H}_2\text{O}$, $\text{Br} \cdot 4\text{H}_2\text{O}$, $\text{Cl} \cdot 4\text{H}_2\text{O}$, $\text{SO}_4 \cdot 11\text{H}_2\text{O}$. The authors consider that these results justify the statement that the hydration is in each case only slight. L. M. J.

Combustion of Gases. By SIMEON N. TANATAR (*Zeit. physikal. Chem.*, 1900, 35, 340—342).—The presence of 11—12 per cent. of propylene in electrolytic gas is sufficient to prevent explosion with the electric spark. When the percentage of propylene is a little lower, and explosion does take place, it is found that the hydrogen remains intact, whilst the oxygen is completely used up in the combustion of the propylene to carbon monoxide and water. Similar results are obtained with methane. The author does not think that the presence of 11—12 per cent. of propylene can lower the temperature of combustion of electrolytic gas below its explosion temperature. He thinks that, although the reaction $6\text{H}_2 + 3\text{O}_2 = 6\text{H}_2\text{O}$ liberates more heat than the reaction $\text{C}_3\text{H}_6 + 3\text{O}_2 = 3\text{CO} + 3\text{H}_2\text{O}$, the reaction velocity of oxygen with hydrocarbons is much greater than with hydrogen. J. C. P.

Reaction between Chloroform and Potassium Hydroxide. By A. P. SAUNDERS (*J. Physical Chem.*, 1900, 4, 660—674).—If, in the reaction between chloroform and potassium hydroxide, $\text{CHCl}_3 + 4\text{KOH} = 3\text{KCl} + \text{KCO}_2\text{H} + 2\text{H}_2\text{O}$, only 3 mols. of potash are primarily concerned, the reaction is quadrimolecular; if, however, the replacement of chlorine by hydroxyl proceeds in successive stages, the reaction is bimolecular. The author has hence determined the reaction velocity for various mixtures and, although no high degree of accuracy is claimed for the determinations, yet they clearly show that, on halving the concentration of both reacting compounds, the velocity is reduced to one-fourth only, and that the velocity is proportional to the concentration of the potassium hydroxide solution, not to the cube of this concentration. The constant, also, calculated for the bimolecular reaction, varies far less than that deduced for a quadrimolecular reaction, so that the author is justified in considering that the replacement of the chlorine proceeds in successive stages. L. M. J.

Agreement between Chemical Formulæ and the Theory of Invariants. By P. GORDAN and WLADIMIR ALEXÉEFF (*Sitzungsber. phys.-med. Soc. Erlangen*, 1900; *Zeit. physikal. Chem.*, 1900, 35, 610—633).—If an atom is supposed to be divided into a number of parts equal to its valency, chemical formulæ may be represented as symbolical products. Thus, when $\text{C} = c_x \cdot c_x \cdot c_x \cdot c_x = c_x^4$, $\text{H} = h_x$, and $\text{O} = o_x \cdot o_x = o_x^2$, propane is represented by $(c_1c_2)(c_2c_3)(c_1h)^3(c_2h)^2(c_3h)^3$,

tert. butyl alcohol by $(c_1c_2)(c_1c_3)(c_1c_4)(c_2h)^3(c_3h)^3(c_4h)^3(c_1o)(oh)$, *p*-dichlorobenzene by $(c_1c_2)(c_2c_3)^2(c_3c_4)(c_4c_5)^2(c_5c_6)(c_6c_1)^2(c_1cl)(c_2h)(c_3h)(c_4cl)(c_5h)(c_6h)$.

On this basis, a far-reaching analogy is discovered between the conceptions, the processes, and the formulæ of chemistry and those of the invariant theory. The chief classes of chemical compounds are discussed from the point of view of this symbolical representation, and, in particular, the formula of indigo is so treated. J. C. P.

Inorganic Chemistry.

Origin of Atmospheric Hydrogen. By ARMAND GAUTIER (*Compt. rend.*, 1900, 131, 647—652).—The hydrogen in the atmosphere may be derived, not only from volcanic action and other well known sources, but also from the action of water on ancient granitic rocks at temperatures considerably below a red heat. Granite from the interior of a fairly large block, powdered in an atmosphere of carbon dioxide and afterwards heated with dilute acids at 100° or with water alone at 280°, yields a considerable quantity of gas, consisting mainly of hydrogen, together with hydrogen sulphide, ammonia, carbon dioxide, nitrogen, and traces of unsaturated hydrocarbons, and sometimes traces of methane. A granite from Vire when heated with phosphoric acid diluted with its own volume of water, gave 1400 c.c. of gas per kilogram and 916 c.c. of this was hydrogen. With water only at 280—300°, the proportion of gas liberated is smaller. The hydrogen and the ammonia that accompanies it are probably due to the action of the water on nitrides and chiefly on iron nitrides, although possibly some of the hydrogen may be derived from its action on carbides. C. H. B.

Higher Hydrogen Peroxides. By A. BACH (*Ber.*, 1900, 33, 3111—3118).—This paper is largely a reply to criticisms by Armstrong (*Proc.*, 1900, 16, 134) and Baeyer and Villiger (*Abstr.*, 1900, ii, 719) of a previous paper (*Abstr.*, 1900, ii, 470). Although Caro's acid when diluted does not reduce potassium permanganate, yet, undiluted, it rapidly decolorises a solution of the latter in concentrated sulphuric acid (permanganic oxide); the titration is sharply defined, and the whole of the oxygen of the persulphate is evolved together with that due to the permanganate. The view that a catalytic decomposition of the Caro's acid here occurs, appears to be excluded by the fact that the latter yields no oxygen either with manganous sulphate or with the liquid obtained after titrating Caro's acid with permanganic anhydride. The existence in Caro's reagent of a "higher persulphuric acid," $(SO_3H \cdot O \cdot O \cdot SO_3H)_3$, is therefore assumed, which on dilution yields the acid, $SO_3H \cdot O \cdot OH$, incapable of reducing potassium permanganate. In the higher acid an ozonoid grouping is probable, since Caro's acid is formed on dissolving sodium dioxide in

well cooled sulphuric acid, although, on warming, ozone is evolved (compare Bamberger, *Abstr.*, 1900, ii, 536). W. A. D.

Action of the Silent Electric Discharge on Sulphur Perfluoride. By MARCELLIN P. E. BERTHELOT (*Ann. Chim. Phys.*, 1900, [vii], 21, 205).—Sulphur perfluoride when submitted to the silent electric discharge remains unaffected, its stability under these conditions being comparable with that of the fluorides of boron and silicon; the gas is not absorbed by bromine, thiophen, or acid solutions of cuprous chloride. G. T. M.

Distribution of Sulphuric Acid in the Atmosphere. By HERMANN OST (*Chem. Centr.*, 1900, ii, 733; from *Chem. Ind.*, 23, 292—296).—In order to compare the quantity of sulphuric acid in the atmosphere at various places, rectangular pieces of cotton wool or floconné, 20 × 30 cm., saturated with barium hydroxide solution, were attached to the branches of trees in such a way that the material was kept taut and these were then left exposed for a considerable period. On the Süntel mountains, far from any commercial industry and where scarcely any coal is burnt, only 0.0555—0.180 gram of sulphur trioxide was found to have been absorbed in 153 days, whilst on the plain north of Hanover between Fuhrberg and Celle and 8 kilometres from the latter, 0.118—0.323 gram was absorbed in 193 days; the maximum amount was obtained by exposing the material in an open position unprotected on every side and away from trees, and the minimum in forests. In the neighbourhood of Hanover, 0.534—0.790 gram was absorbed in 175 days. Any sulphur present in mineral dust was excluded from the tests. E. W. W.

Persulphates. By RODOLFO NAMIAS (*L'Orosi*, 1900, 23, 218—223).—Persulphates rapidly absorb moisture from the air with the formation of the corresponding sulphate and sulphuric acid accompanied by the evolution of oxygen. Solutions of the persulphates are, however, very stable and may be employed in volumetric analysis for the estimation of substances having a reducing action. The best method of estimating the persulphates is to add excess of potassium iodide to a cold solution of the persulphate having a concentration not greater than 0.5 per cent. and after the liquid has remained for 10—12 hours, to estimate the free iodine by means of standard sodium thiosulphate solution.

In neutral solution, the persulphates have the power of dissolving many metals such as zinc, iron, and aluminium, the two normal sulphates being formed; copper is not attacked by neutral or acid solutions of the persulphates but is rapidly dissolved in presence of ammonia, under which conditions zinc and iron are slowly acted on. Silver undergoes gradual solution by either the acid or ammoniacal solution.

Chromium salts, in solutions either neutral or faintly acid with sulphuric acid, are quantitatively converted into chromic acid by excess of persulphate, a reaction useful in the estimation of chromium in steels, the chromium being first converted into chromate by means

of persulphate, the iron then separated by the addition of ammonia, and the chromate finally determined volumetrically.

By mixing ammonium persulphate and ammonium hydroxide with the solution of a manganese salt, complete precipitation of a hydrated manganese dioxide takes place, the oxidation being much easier and more convenient than when bromine is employed.

The oxidising action of persulphates in either acid or neutral solution can be made use of in the bleaching of such materials as textile fabrics, wood, and ivory, whilst when mixed with sulphuric acid they have the function of energetic depolarisers and may replace the nitric acid of the Bunsen cell.

When heated with a persulphate at 70—80°, ethyl alcohol is rapidly converted into aldehyde, whilst many organic compounds capable of oxidation, especially closed chain compounds, give up hydrogen and yields sulphonic derivatives. Thus quinol reacts with the persulphates, forming an insoluble sulpho-compound, and diaminophenol, *p*-phenylenediamine, *p*-aminophenol, &c., give characteristic colour reactions. On adding a persulphate to a cold solution of aniline hydrochloride, a dark green precipitate is formed, which is insoluble in water or alcohol and when treated with sodium hydroxide or carbonate solution turns dark green but remains insoluble.

T. H. P.

Action of Hydrogen Peroxide on Thiosulphates. By ARNOLD NABL (*Ber.*, 1900, 33, 3093—3095).—When hydrogen peroxide is added to a solution of sodium thiosulphate, a marked rise of temperature occurs and the solution becomes alkaline to litmus. This reaction is not due to liberation of sodium hydroxide, but to the formation of a new sulphur base, possibly in accordance with the equation $2\text{Na}_2\text{S}_2\text{O}_3 + \text{H}_2\text{O}_2 = \text{Na}_2\text{SO}_4 + \text{Na}_2\text{SO}_3 + \text{S}_2\text{H}\cdot\text{OH}$.

The new base is not volatile with steam, is insoluble in alcohol, and its aqueous solution has a strongly alkaline reaction and a green fluorescence. It precipitates the hydroxides of silver, copper, iron, and uranium from their salts, reduces hot Fehling's solution, and precipitates the sulphide from stannic chloride. It yields a platinichloride which is quickly reduced, especially on heating. The base probably possesses analogies with trimethylsulphine hydroxide and with hydroxylamine.

A. L.

Nitrogen Iodide. By OTTO RUFF (*Ber.*, 1900, 33, 3025—3029).—When iodine is added to liquid ammonia cooled to -60° , a black powder (possibly $\text{NI}_3\cdot\text{NI}_3$) is first formed, but eventually brownish-red plates with a greenish shimmer are obtained, which have the composition $\text{NI}_3\cdot 12\text{NH}_3$. At -35° to -40° , olive-green needles with the composition $\text{NI}_3\cdot 3\text{NH}_3$ are obtained; under diminished pressure, these lose ammonia and yield ordinary nitrogen iodide, $\text{NI}_3\cdot\text{NH}_3$ (compare Hugot, *Abstr.*, 1900, ii, 274).

When one atom of iodine is added to a mixture of 1 mol. of sodamide and liquid ammonia, cooled with liquid air, a violent reaction takes place; the product is a black compound, apparently of the composition Na_2NI_3 , in which the nitrogen is quinquivalent. On further addition of a second atom of iodine, or of 1 mol. of ammonium iodide,

one or other of the compounds $\text{NI}_3, 12\text{NH}_3$ and $\text{NI}_3, 3\text{NH}_3$ is formed, according to the temperature.

The cooling mixtures required were obtained by adding alcohol slowly to liquid air contained in a Dewar's beaker or in a beaker jacketed with cotton-wool, until the solidified alcohol redissolved to a syrupy liquid; when the temperature had risen to -70° , more liquid air and then alcohol were added as before, and the operation was repeated until enough of the mixture had been prepared. The substances prepared were filtered through glass wool and asbestos in a filter tube surrounded with the cooling mixture, which was contained in a Dewar's vessel. The washing was performed in the same tube, first with cooled liquid ammonia, then with cooled absolute ether.

C. F. B.

Formation of Nitric Acid during Combustions. By MARCELLIN P. E. BERTHELOT (*Ann. Chim. Phys.*, 1900, [vii], 21, 145—201).—The experimental results embodied in these five memoirs have already been published (compare Abstr., 1899, ii, 648; 1900, ii, 475, 476, 538).

G. T. M.

Arsenic Triiodide. By R. DUPOUY (*Chem. Centr.*, 1900, ii, 836; from *Bull. Trav. Soc. Pharm. Bordeaux*).—A sample of officinal arsenic triiodide, consisting of a crystalline powder, when treated with water left a yellow, insoluble residue of antimony oxyiodide, SbOI , this compound being formed by the action of water on antimony triiodide contained in the drug. The insoluble residue from a second sample consisted of antimony oxyiodide and free arsenic, whilst a third sample left a residue of free arsenic alone. Another preparation contained an excess of free iodine and formed a clear brown solution which gradually became colourless. Arsenic triiodide should be tested by titrating with mercuric chloride, silver nitrate, or iodine solution; in the first case, the compound $\text{HgI}_2, 2\text{HI}$ is formed, whilst in the last two silver iodide and hydriodic acid are formed respectively.

E. W. W.

Constitution of the Perborates. By EMIL J. CONSTAM and J. CORA BENNETT (*Zeit. anorg. Chem.*, 1900, 25, 265—269).—The mode of preparation of the perborates and the fact that the ammonium salt contains $\frac{1}{2}\text{H}_2\text{O}$ appear to indicate a doubled formula for these compounds. The authors, however, find that the difference between the electrical conductivities at $v=1024$ and $v=32$ is 9.4 units, indicating a monobasic acid, so that the simple formula must be assumed. Attempts to produce a perborate by the electrolysis of orthoborates were unsuccessful, and hence did not confirm Tanatar's observations (Abstr., 1898, ii, 427).

L. M. J.

Reactions of Oxygen and Carbon Monoxide in the Presence of Alkalis. By MARCELLIN P. E. BERTHELOT (*Ann. Chim. Phys.*, 1900, [vii], 21, 205—206).—After leaving a mixture of equal volumes of carbon monoxide and oxygen at the ordinary temperature for three months over a concentrated solution of potassium hydroxide, it was found that the former gas was absorbed by the alkali to form potassium formate, whilst the whole of the latter remained unchanged; a

similar result was attained in 14 hours by conducting the experiment at 100°. When ammonia is substituted for potassium hydroxide either at the ordinary temperature or at 100°, there is no formation of ammonium carbonate, and the absorption of carbon monoxide is very slight.

G. T. M.

Action of Sodammonium and Potassammonium on certain Metalloids. By CHARLES HUGOT (*Ann. Chim. Phys.*, 1900, [vii], 21, 5—87).—This memoir contains an extensive bibliography and a detailed account of the preparation of compounds previously described (compare Abstr., 1896, ii, 20; 1898, ii, 573; 1899, ii, 151, 650, 747; 1900, ii, 14, 274).

G. T. M.

Hydration Processes. By PAUL ROHLAND (*Ber.*, 1900, 33, 2831—2833. Compare Abstr., 1899, ii, 590).—It has been found that certain substances exert an influence on the hydration of Portland cement exactly similar to that which they have on the hydration of calcium oxide. Thus calcium chloride, aluminium chloride, and sodium carbonate accelerate, potassium dichromate, calcium chromate, boric acid, borax and potassium sulphate retard hydration, and sodium or lithium chloride has no action.

The same generalisations do not hold good for the hydration of calcium sulphate; in this process, sodium chloride, aluminium chloride, potassium dichromate, calcium chromate, and potassium sulphate accelerate, boric acid, borax and sodium carbonate retard hydration, and calcium chloride is indifferent.

The acceleration or retardation is roughly proportional to the concentration of the solution of substance employed. If the velocity of hydration is great, then the added substance has a greater influence, either accelerating or retarding, than when the velocity is small.

J. J. S.

Constitution of Hydraulic Cements. By ORAZIO REBUFFAT (*Gazzetta*, 1900, 30, ii, 177—182).—A correction of misquotations of the author's views on this question.

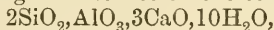
T. H. P.

Action of Sea-Water on Pozzuolana Mortar. By ORAZIO REBUFFAT (*Gazzetta*, 1900, 30, ii, 157—164).—The author's experiments lead to the following conclusions. 1. Sea-water transforms the cement of mortar made from pozzuolana into a hydrated aluminium silicate which contains small quantities of lime, magnesia, and the alkalis, and is perfectly stable towards the salts of sea-water. 2. Since pozzuolana mortar immersed in sea-water ultimately loses the whole of its lime, the employment of mixed mortars of cement and pozzuolana recommended by Michaelis cannot result in the fixation of the free lime of the cement.

T. H. P.

Artificial Pozzuolana. By ORAZIO REBUFFAT (*Gazzetta*, 1900, 30, ii, 182—190).—Experiments on artificial pozzuolana lead to the following conclusions. 1. Aluminium silicate of the composition $2\text{SiO}_2 \cdot \text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$, when heated at 700—800°, loses water and assumes the nature of pozzuolana; the residue has not the power to take up again the moisture given off. It is to the presence of this silicate that

clay owes the pozzuolana properties it acquires on heating. 2. The silicate is not more easy of attack by hydrochloric acid after heating, although it becomes readily soluble in dilute alkali hydroxide solutions. 3. The compound $2\text{SiO}_2\cdot\text{Al}_2\text{O}_3$ combines with lime in the presence of water, giving a substance of the composition



the formation of which determines the setting of pozzuolana made from kaolin or from clay heated at $700\text{--}800^\circ$. 4. This double silicate is readily decomposed by acids or by solutions of ammonium or magnesium salts, these salts removing the lime and leaving a hydrated aluminium silicate, $2\text{SiO}_2\cdot\text{Al}_2\text{O}_3\cdot 4\text{H}_2\text{O}$, which in its chemical characters closely resembles certain varieties of the mineral halloysite. T. H. P.

Slow Action of Hydrogen Bromide on Glass. By MARCELLIN P. E. BERTHELOT (*Ann. Chim. Phys.*, 1900, [vii], 21, 206).—When glass tubes containing gaseous hydrogen bromide are examined after two years, a portion of the gas is found to have disappeared and drops of its aqueous solution are formed, the water being probably derived from the slow action of the gas on the alkaline silicates and sulphates which enter into the composition of the glass. G. T. M.

Radio-active Lead and Radio-active Rare Earths. By KARL A. HOFMANN and EDUARD STRAUSS (*Ber.*, 1900, 33, 3126—3131).—Pure lead sulphate was isolated from pitchblende, the uranium micas, bröggerite, cleveite, and samarskite, which was radio-active although containing no trace of bismuth (polonium), barium (radium), titanium, thorium or uranium; the sulphate was insoluble in dilute sulphuric acid, but easily soluble in basic ammonium tartrate. The derived lead chloride crystallised from hot water, and then showed diminished radio-activity, whilst the crystals from the mother liquors showed increased activity. Only traces of radio-active bismuth could be isolated from pitchblende, the uranium micas and samarskite.

A mixture of cerium and yttrium oxalates, isolated from bröggerite, cleveite and samarskite, and freed from thorium and uranium, was found to be radio-active, the oxides derived therefrom being especially so. Uranosouranic oxide, U_3O_8 , from all the minerals already named, and also from euxenite, is always radio-active, and the same is true of the derived uranium oxalate, although on recrystallising the latter, the most soluble fractions are found to be inactive. Thoria from bröggerite, cleveite, and samarskite is active, although from euxenite, which is closely allied to samarskite in composition it is obtained inactive. W. A. D.

Formation of Mixed Crystals of Thallium Nitrate and Thallium Iodide. By C. VAN EYK (*Proc. K. Akad. Wetensch. Amsterdam*, 1900, 3, 98—101).—The relation between the composition of mixtures of the fused salts and that of the mixed crystals deposited on cooling has been examined. The melting point line is of Roozeboom's type IV (compare Abstr., 1900, ii, 132), and rises immediately from the solidifying point of the nitrate, showing that mixed crystals are deposited from the melt. The mixed crystals deposited on solidification of mixtures with 0—9.9 molecular per cent. of the iodide are white; those from mixtures with more iodide are red. The white mixed crystals contain

from 0—8 molecular per cent. of the iodide, and the red from 65—100 per cent. Mixtures containing from 18—65 molecular per cent. of the iodide solidify at 215.5° to a conglomerate of the limiting mixed crystals. Thallium nitrate, which is rhombic at the ordinary temperature, is rhombohedral above 142° , but this transition temperature is lowered by admixture with the iodide; similarly, the transition point (169°) of the iodide is lowered by addition of nitrate. J. C. P.

Alterations in the Chemical Properties of Elements Produced by the Addition of Traces of Foreign Substances. By GUSTAVE LE BON (*Compt. rend.*, 1900, 131, 706—708).—When mercury is alloyed with traces of magnesium, it acquires the property of decomposing water, and becomes rapidly oxidised by exposure to the air at the ordinary temperature, a perceptible alteration being caused by the addition of only $1/14,000$ th part of magnesium. Magnesium contaminated with mercury rapidly decomposes water in the cold.

Aluminium foil, coated with a thin film of mercury, is quickly oxidised on exposure to air, and a strip of the metal placed vertically in a vessel containing water and mercury is continuously corroded at its lower end until completely disintegrated (compare Hunt and Steele, *Abstr.*, 1899, ii, 33). G. T. M.

Behaviour of Mixtures of Mercuric Iodide and Silver Iodide. By H. W. BAKHUIS ROOZEBOOM (*Proc. K. Akad. Wetensch. Amsterdam*, 1900, 3, 84—86).—Investigation of fused mixtures of these salts shows that the melting point of mercuric iodide is lowered from 257° to 242° by an admixture of 14 molecular per cent. of silver iodide, whilst the melting point of silver iodide is lowered from 526° to 242° by an admixture of 86 molecular per cent. of mercuric iodide. The course of solidification shows that two kinds of mixed crystals are formed; on the mercuric iodide side, crystals of the rhombic mercuric iodide type with 0—4 molecular per cent. of silver iodide, on the other side crystals of the regular silver iodide type with 18—100 molecular per cent. of silver iodide. After solidification, mixtures containing from 4—18 molecular per cent. of silver iodide consist of a conglomerate of the two limiting mixed crystals. Those with 4 per cent. of silver iodide undergo a change at about 127° , because the mercuric iodide is transformed from the rhombic into the tetragonal form. When the mixtures with 18—100 molecular per cent. of silver iodide are cooled below 157° , the mixed crystals of the composition $\text{HgI}_2, 2\text{AgI}$ are suddenly transformed into a compound of the same composition, the colour changing at the same time from pink to red. This temperature (157°) is comparable with the solidifying point of a chemical compound deposited from a liquid mixture. From mixed crystals containing less silver iodide than corresponds with the formula $\text{HgI}_2, 2\text{AgI}$, the formation of the latter compound occurs at temperatures from 157 — 118° ; from mixed crystals containing more, at temperatures from 157 — 135° . The temperatures, 118° and 135° , are analogous to eutectic points, the conglomerates formed consisting of $\text{HgI}_2, 2\text{AgI}$ with either HgI_2 or AgI . The temperature of transformation of regular silver iodide into the hexa-

gonal form is lowered by admixture of mercuric iodide from 157° to 135° ; the temperature of transformation of rhombic mercuric iodide into the tetragonal form is lowered by admixture of silver iodide from 127° to 118° . When the conglomerates of double salt with mercuric or silver iodide are further cooled to 45° , the double salt changes from red to yellow, whether it is pure or mixed with mercuric or silver iodide.

J. C. P.

Separation of Cerite Earths from Monazite Sand. By RICHARD JOS. MEYER and E. MARCKWALD (*Ber.*, 1900, **33**, 3003—3013).—The crude material is the commercial 'cerium oxalicum oxydul pur,' which is obtained as a residue after the extraction of thorium from monazite sand; it contains 25 per cent. of water and gave 32.5 per cent. of cerium oxalate, 21.5 per cent. of didymium oxalate, and 14 per cent. of lanthanum oxalate. The oxalates are dissolved in nitric acid and separated as ammonium double nitrates. The cerium is precipitated as basic ceric sulphate from a solution of the mixed nitrates by adding ammonium persulphate and chalk (Witt and Theel, *Abstr.*, 1900, ii, 403), and is purified by dissolving in boiled nitric acid (nitric oxide reduces the ceric salt), separating as ammonium double nitrate, and recrystallising from nitric acid. The didymium and lanthanum salts in the filtrate from the cerium precipitation are separated (from ytterbium salts, &c.) by adding potassium sulphate to the boiling solution until it no longer shows the didymium absorption-spectrum; the double sulphates which separate can be dissolved by boiling with nitric acid and pouring into boiling water, and are purified by precipitating as oxalates; these are then dissolved in nitric acid, and the solution is boiled until free from acid. The separation of didymium from lanthanum is effected by adding magnesia until the solution no longer shows the didymium spectrum (Muthmann and Rölzig, *Abstr.*, 1898, ii, 518); by repeating this operation twice and precipitating twice with oxalic acid and ammonia, the didymium is obtained nearly pure and free from all but a mere trace of lanthanum. The lanthanum is finally precipitated with ammonium oxalate in presence of ammonium chloride. T. M. L.

Molecular Weight of Aluminium Compounds. By ELMER P. KOHLER (*Amer. Chem. J.*, 1900, **24**, 385—397).—The molecular weights of the aluminium derivatives of acetylacetone and ethyl acetoacetate were determined by the boiling point method, carbon disulphide being used as the solvent, and found to accord respectively with the formulæ $\text{Al}(\text{C}_5\text{H}_7\text{O}_2)_3$ and $\text{Al}(\text{C}_6\text{H}_9\text{O}_3)_3$.

Determinations of the molecular weights of aluminium bromide and iodide in the same solvent agree with the formulæ Al_2Br_6 and Al_2I_6 .

The molecular weights of the compounds of aluminium bromide with benzenesulphonic chloride and nitrobenzene, and of the compound of aluminium chloride with nitrobenzene, are shown by the same method to correspond with the formulæ $\text{Al}_2\text{Br}_6 \cdot 2\text{C}_6\text{H}_5 \cdot \text{SO}_2\text{Cl}$; $\text{Al}_2\text{Br}_6 \cdot 2\text{C}_6\text{H}_5 \cdot \text{NO}_2$, and $\text{Al}_2\text{Cl}_6 \cdot 2\text{C}_6\text{H}_5 \cdot \text{NO}_2$; in each case, it appears that 1 mol. of the aluminium haloid combines with 2 mols. of benzenesulphonic chloride or nitrobenzene to form 1 mol. of the product. It follows that the

addition of benzenesulphonic chloride or nitrobenzene to a solution of aluminium bromide of known boiling point should not affect the boiling point so long as the bromide is in excess; on the other hand, the addition of the bromide to a solution of benzenesulphonic chloride or nitrobenzene should immediately lower the boiling point, and the depression should be proportional to the quantity of bromide added; these conclusions were verified by experiment. A method is thus obtained for determining the changes which occur when an aluminium haloid is brought into contact with a given substance in an indifferent medium. The substance under investigation is added in successive portions to a solution of aluminium bromide of known concentration and boiling point until it is present in excess, and a further quantity of aluminium bromide is then added; the readings of the thermometer after each addition of material give an accurate account of what is taking place in the solution. By this means, it was found that the compounds of aluminium bromide with benzoyl chloride, benzophenone, and phosphorus oxychloride have respectively the composition $\text{Al}_2\text{Br}_6, 2\text{C}_6\text{H}_5 \cdot \text{COCl}$, $\text{Al}_2\text{Br}_6, 2\text{COPh}_2$, and $\text{Al}_2\text{Br}_6, 2\text{POCl}_3$. Acetophenone, benzenesulphonacetone, and ethyl benzoate form similar additive products with aluminium haloids; benzene and naphthalene, however, slowly react to form insoluble compounds, whilst pyridine and quinoline yield crystalline additive compounds also insoluble in carbon disulphide. An experiment with aluminium bromide and *p*-dibromobenzene showed that the non-applicability of Friedel and Crafts' reaction to dihalogen compounds is not due to a combination of the dihalogen compound with the aluminium haloid.

If one of the components of the additive compounds is present in large excess, dissociation occurs; thus, cryoscopic determinations of the molecular weights of aluminium bromide and chloride in nitrobenzene solution point to the formulæ AlBr_3 and AlCl_3 . Benzoyl chloride combines with aluminium bromide, in the absence of a solvent, to form a compound the molecular weight of which is shown by determination in carbon disulphide to correspond with that required for the formula $\text{Al}_2\text{Br}_6, 2\text{C}_6\text{H}_5 \cdot \text{COCl}$, whereas the determination in nitrobenzene gives an impossible value.

The conclusion of Werner and Schmujlow (Abstr., 1898, ii, 214), that AlCl_3 is the only formula admissible for aluminium chloride is not justified, since they determined the molecular weight in pyridine, which combines with aluminium chloride to form a well crystallised compound. E. G.

Cobalt Selenide. By HENRI FONZES-DIACON (*Compt. rend.*, 1900, 131, 704—705).—The selenide, CoSe , is obtained in an amorphous form by the action of selenium vapour on cobalt, and also by that of hydrogen selenide on heated cobalt oxide or chlorate.

The *sesquiselenide*, Co_2Se_3 , is produced by passing hydrogen selenide over cobalt chloride at moderately high temperatures; at lower temperatures, these substances react with the formation of friable grey *diselenide*, corresponding with the formula CoSe_2 ; this substance readily evolves selenium when heated.

The *selenide*, Co_3Se_4 , prepared by the interaction of hydrogen

selenide, hydrogen chloride, and cobalt chloride at a dull red heat, forms violet-grey, regular octahedra, the specific gravity at 15° being 6.54.

A *subselenide*, Co_2Se , is obtained as a fused mass with a silvery lustre by reducing the preceding compounds in a current of hydrogen at a bright red heat; when this action is continued for some considerable time, the substance undergoes further reduction, but without yielding cobalt.

These selenides are only slowly decomposed by hydrochloric acid and by hydrogen chloride at high temperatures. Chlorine and oxygen displace selenium from the heated selenides, the action in the latter case giving rise to the formation of selenium dioxide and cobalt oxide. The selenides readily dissolve in bromine water containing excess of bromine.

Cobalt selenate, when reduced by hydrogen, yields either oxyselenides or a mixture of selenides and cobalt, according to the temperature
G. T. M.

Ammoniacal Cobalt Arsenates. By O. DUCRU (*Compt. rend.*, 1900, 131, 675—678).—The action of arsenic acid or an arsenate on solutions of cobalt salts containing ammonium salts and ammonia yields three insoluble ammoniacal cobaltous arsenates,

$\text{Co}_3(\text{AsO}_4)_2, 2\text{NH}_3, 7\text{H}_2\text{O}$,
 $\text{Co}_3(\text{AsO}_4)_2, 2\text{NH}_3, 6\text{H}_2\text{O}$, and $\text{Co}_3(\text{AsO}_4)_2, 3\text{NH}_3, 5\text{H}_2\text{O}$, formed from the hydrated arsenate, $\text{Co}_3(\text{AsO}_4)_2, 8\text{H}_2\text{O}$, by the partial displacement of water by an equal number of ammonia molecules. The composition of the product depends on the proportion of ammonia present, and is not affected by the proportion of ammonium salts.
C. H. B.

Ammoniacal Nickel Arsenates. By O. DUCRU (*Compt. rend.*, 1900, 131, 702—704. Compare preceding abstract).—A solution containing a mixture of nickel and ammonium salts and free ammonia when treated with arsenic acid or a soluble arsenate, produces in the cold or on gently warming a gelatinous greenish-white precipitate which deepens in colour and becomes crystalline when the mixture is heated on the water-bath. The crystals are anisotropic and belong to the monoclinic system; they vary in composition according to the amount of ammonia present.

The octahydrated nickel arsenate, produced in the absence of ammonia, crystallises in needles and is identical in composition and crystalline form with the mineral annabergite. When the solution contains 1.38 per cent. of ammonia, a *monoammonionickel arsenate* is obtained; with 6.9 per cent. of this reagent, a *diammonio*-salt is formed, the corresponding *triammonio*-compound being precipitated in more concentrated ammoniacal solutions. These salts behave in a characteristic manner when heated at 155°, the composition of the compounds before and after heating being indicated in the following table:

$\text{Ni}_3(\text{AsO}_4)_2, 8\text{H}_2\text{O}$.	$\text{Ni}_3(\text{AsO}_4)_2, 1\frac{1}{2}\text{H}_2\text{O}$.
$\text{Ni}_3(\text{AsO}_4)_2, 7\text{H}_2\text{O}, \text{NH}_3$.	$\text{Ni}_3(\text{AsO}_4)_2, 1\text{H}_2\text{O}, \frac{3}{4}\text{NH}_3$.
$\text{Ni}_3(\text{AsO}_4)_2, 6\text{H}_2\text{O}, 2\text{NH}_3$.	$\text{Ni}_3(\text{AsO}_4)_2, \frac{1}{2}\text{H}_2\text{O}, \frac{3}{4}\text{NH}_3$.
$\text{Ni}_3(\text{AsO}_4)_2, 5\text{H}_2\text{O}, 3\text{NH}_3$.	$\text{Ni}_3(\text{AsO}_4)_2, \frac{1}{2}\text{H}_2\text{O}, \frac{1}{2}\text{NH}_3$.

The anhydrous arsenate, $\text{Ni}_3(\text{AsO}_4)_2$, is obtained in each case on heating the salt at dull red heat. G. T. M.

Periodic Phenomena in the Dissolution of Chromium in Acids. By WILHELM OSTWALD (*Zeit. physikal. Chem.*, 1900, 35, 204—256).—A continuation of the author's earlier paper (Abstr., 1900, ii, 730), in which the previous observations of periodicity by the dissolution of metals are fully discussed, and improvements on the apparatus employed by the author are described. An alloy of chromium and aluminium was employed and the effect of various compounds in bringing about regular periodicity investigated. It was found that dextrin has a remarkably powerful effect in this direction, other colloidal carbohydrates being active to a smaller extent. The periodic time increases as the action progresses and a number of experiments testing the regularity of this increase are recorded. Various curves obtained are given in the paper and further investigations are promised. L. M. J.

The System $\text{Bi}_2\text{O}_3\text{—N}_2\text{O}_5\text{—H}_2\text{O}$. By JACOBUS M. VAN BEMMELEN [and G. M. RUTTEN] (*Proc. K. Akad. Wetensch. Amsterdam*, 3, 196—203).—The various solid phases of this system have been examined. The normal salt, $\text{Bi}_2\text{O}_3, 3\text{N}_2\text{O}_5, 10\text{H}_2\text{O}$, has not a true melting point, but decomposes at 75.5° into a liquid and the basic salt $\text{Bi}_2\text{O}_3, \text{N}_2\text{O}_5, \text{H}_2\text{O}$. Two other normal salts with $4\text{H}_2\text{O}$ and $3\text{H}_2\text{O}$ respectively, have been discovered but not isolated; their composition has been deduced by means of Schreinemakers' graphical method. The basic salt, $\text{Bi}_2\text{O}_3, \text{N}_2\text{O}_5, 2\text{H}_2\text{O}$, is the first product of the action of cold water or dilute nitric acid (with less than 6 per cent. of N_2O_5) on the decahydrate, or of cold water on a not too acid solution of bismuth nitrate. It forms very thin, crystalline plates, without definite shape and showing double refraction; these cannot be dried over sulphuric acid without decomposition, and in contact with the mother liquor they are converted into another basic salt. The basic salt, $\text{Bi}_2\text{O}_3, \text{N}_2\text{O}_5, \text{H}_2\text{O}$, is formed from $\text{Bi}_2\text{O}_3, \text{N}_2\text{O}_5, 2\text{H}_2\text{O}$ when the latter remains in contact with a solution containing more than 1 per cent. of N_2O_5 ; the time required for its formation diminishes as the percentage of N_2O_5 rises. The crystals are monoclinic, but when the same salt is formed by the decomposition of the decahydrate at 75.5° , it has the form of thin, hexagonal prisms. The basic salt, $6\text{Bi}_2\text{O}_3, 5\text{N}_2\text{O}_5, 9(8)\text{H}_2\text{O}$, is formed at the ordinary temperature from $\text{Bi}_2\text{O}_3, \text{N}_2\text{O}_5, 2\text{H}_2\text{O}$, when the latter remains for some months in contact with a very dilute solution (less than 1 per cent. of N_2O_5 and less than 0.33 per cent. of Bi_2O_3); it is obtained also when the decahydrate is decomposed with water, and the solid salt which is formed is dissolved in much water. The crystals belong to the rhombic system; over sulphuric acid, they lose neither nitric acid nor water. The salt $2\text{Bi}_2\text{O}_3, \text{N}_2\text{O}_5, \text{H}_2\text{O}$ is the final product of the action of boiling water on the normal salt. The compounds $\text{Bi}_2\text{O}_3, 2\text{N}_2\text{O}_5, 2\text{H}_2\text{O}$ and $10\text{Bi}_2\text{O}_3, 9\text{N}_2\text{O}_5, 7\text{H}_2\text{O}$ are also described. The basic salts, $5\text{Bi}_2\text{O}_3, 4\text{N}_2\text{O}_5, 9\text{H}_2\text{O}$, $4\text{Bi}_2\text{O}_3, 3\text{N}_2\text{O}_5, 9\text{H}_2\text{O}$, $5\text{Bi}_2\text{O}_3, 3\text{N}_2\text{O}_5, 8\text{H}_2\text{O}$, and $5\text{Bi}_2\text{O}_3, 3\text{N}_2\text{O}_5, 6\text{H}_2\text{O}$, described by other investigators, are declared not to exist.

Isotherms, giving the composition of the liquid phases which are in

equilibrium with the different solid phases have been totally or partially determined for the temperatures 20° , 30° , and 65° . The isotherms have been graphically represented in equilateral triangles, and from these a figure in space has been drawn showing the conditions of equilibrium. The form of the triple lines in this system agrees with the form of those for the system $\text{HgO}-\text{SO}_3-\text{H}_2\text{O}$ (Hoitsemma, Abstr., 1896, ii, 15).
J. C. P.

Egyptian Gold. By MARCELLIN P. E. BERTHELOT (*Ann. Chim. Phys.*, 1900, [vii], 21, 202—204).—Analyses of Egyptian gold coins of the earliest epochs indicate that the material employed in their preparation consisted of argentiferous alluvial gold; only in later periods, from the time of Cræsus onwards, does it appear that the metal was refined, the desilverisation process being that described by Pliny. Owing to the rarity of minerals yielding gold free from silver, it is possible, by analyses of the golden articles found in Egyptian tombs, to state approximately the epoch of their manufacture.

The gold leaf coverings of the mummies of the 6th and 12th dynasties contain 90—92 per cent. of gold, about 4 per cent. of silver, and 4—5 per cent. of organic matter, whereas those of the Persian epoch, ten centuries later, consist of nearly pure gold. G. T. M.

Certain Properties of Alloys of the Gold-Copper Series. By SIR W. C. ROBERTS-AUSTEN and T. KIRKE ROSE (*Proc. Roy. Soc.*, 1900, 67, 105—112).—The authors have investigated the freezing point curve for gold-copper mixtures. The freezing points of the pure metals are respectively, gold, 1063° ; copper, 1083° , and a minimum of 905° corresponding with an eutectic mixture was found for the alloy containing about 82 per cent. of gold, or 60 per cent. in atomic proportions. The atomic proportions of the eutectic mixture agree closely with those for the eutectic mixture of silver-copper, the freezing point curves also resembling one another closely. Microscopic examination was made of the various alloys, and these confirmed the existence of the eutectic alloy which makes its appearance even in the solidification of alloys containing only 27 per cent. of gold, as gold is comparatively slightly soluble in copper. Copper is, however, more easily soluble in gold than in silver, so that the character of rich gold-copper alloys is not very marked, the crystals closely resembling those of pure gold.
L. M. J.

Mineralogical Chemistry.

Minerals of Roumania. By PETRU PONI (*Ann. Sci. Univ. Jassy*, 1900, 1, 15—148).—A complete and systematic description is given of Roumanian minerals, with notes on their occurrence at various localities. The paper is in French, and quotes much information and many analyses (some of which are given below) from the somewhat inaccessible Roumanian journals. Structural formulæ are discussed,

and several new analyses are given. Two new minerals are described under the names badenite and brostenite.

Pyrrhotite: an analysis (I) by Saligny, published in 1883, gives the formula $\text{Fe}_{18}\text{S}_{19}$. Copper-pyrites gave the results under Ia.

Badenite.—This is a massive mineral with a granular structure and steel-grey colour; sp. gr. 7.104. It occurs with chalybite, erythrite, and annabergite at Badeni, district of Muscel. From the analysis (II) it appears to be related to smaltite (or safflorite), but with part of the arsenic replaced by bismuth; formula $(\text{Co}, \text{Ni}, \text{Fe})_2(\text{As}, \text{Bi})_3$. Smaltite, also from Badeni, gave Saligny in 1883 the results under III (also CaCO_3 , 5.19; MgCO_3 , 1.46; insoluble, 4.99; manganese, trace).

	S.	Cu.	Fe.	Co.	Ni.	As.	Bi.	Gangue.	Total.
I.	30.29	0.22	50.20	—	—	—	—	19.18	99.89
Ia.	33.96	33.57	32.02	—	—	—	—	0.20	99.75
II.	0.27	—	5.98	20.56	7.39	61.54	4.76	—	100.50
III.	—	0.33	12.26	21.93	—	52.43	0.67	—	100.30

Twenty-seven analyses are given of salt; besides sodium chloride, there are small amounts of magnesium chloride, sodium sulphate, calcium sulphate, water and insoluble matter. Analyses are also given of hæmatite, magnetite and limonite.

Brostenite.—This occurs abundantly as compact, friable, black masses in crystalline schists near Brosteni, district of Sucéva. It sometimes surrounds rhodochrosite, of which mineral it is evidently an alteration product. The three recalculated analyses (IV—VI) give the formulæ, $2\text{MnO}_2, \text{RO}, 2\text{H}_2\text{O}$, $3\text{MnO}_2, \text{RO}, 1\frac{1}{2}\text{H}_2\text{O}$, and $13\text{MnO}_2, 5\text{RO}, 12\text{H}_2\text{O}$ respectively. The mineral is therefore a manganite of iron and manganese, and is perhaps related to chalcophanite, $2\text{MnO}_2, (\text{Mn}, \text{Zn})\text{O}, 2\text{H}_2\text{O}$.

	MnO_2 .	MnO.	FeO.	CaO.	MgO.	H_2O .	CaCO_3 .	Gangue.	Total.
IV.	52.40	6.16	11.47	3.05	—	11.97	—	14.75	99.80
V.	68.06	8.96	4.08	3.82	0.61	7.17	1.97	5.51	100.18
VI.	61.95	3.11	12.02	2.70	0.72	10.90	—	8.20	99.60

A white, saccharoidal, dolomitic limestone from Sucéva gave analysis VII; greyish-yellow crystalline chalybite associated with badenite gave VIII; yellowish, amorphous rhodochrosite associated with brostenite gave IX.

	CaO.	MgO.	FeO.	MnO.	CO_2 .	Insol.	Total.	Sp. gr.
VII.	34.30	18.43	—	—	47.36	0.30	100.39	—
VIII.	4.46	7.21	40.72	6.12	39.49	2.21	100.21	3.455
IX.	4.07	2.30	3.17	50.29	39.02	1.42	100.27	3.193

Large crystals of augite gave anal. X by Murgoci (1895). Acicular crystals of tremolite from the dolomitic limestone of Sucéva (anal. VII) gave XI. Zoisite gave XII by Murgoci (1894). Analyses of serpentine, by Murgoci (1895), and of riebeckite (Abstr., 1899, ii, 768), are quoted.

	SiO_2 .	Al_2O_3 .	Fe_2O_3 .	CaO.	MgO.	H_2O .	Total.	Sp. gr.
X.	45.82	37.46	—	14.20	4.16	—	101.66	3.232
XI.	58.22	0.92	—	13.37	25.33	1.76	99.60	2.937
XII.	36.49	34.19	—	24.81	3.67	2.91	102.07	—

New analyses of roumanite (Abstr., 1897, ii, 502 ; 1898, ii, 523) are given under XIII and XIV ; the first is of yellowish-brown material, and the second of material showing golden and greenish flashes. Seven analyses are also given of ozocerite (Abstr., 1897, ii, 502).

	C.	H.	O.	S.	Ash.	Total.	Succinic acid.	Melting point.
XIII.	80.04	9.76	9.13	0.83	0.24	100.00	3.2	310—312°
XIV.	80.32	10.02	8.17	1.06	0.43	100.00	2.1	318—320

Numerous analyses are also given of mineral waters and of various naturally occurring saline substances, as well as of anthracite and lignite.

L. J. S.

Chemical Composition of Turquoise. By SAMUEL L. PENFIELD (*Amer. J. Sci.*, 1900, [iv], 10, 346—350).—The formula of turquoise is usually given as $2\text{Al}_2\text{O}_3, \text{P}_2\text{O}_5, 5\text{H}_2\text{O}$, the copper, which is always present, being considered to be an accidental impurity ($2\text{CuO}, \text{P}_2\text{O}_5, 4\text{H}_2\text{O}$ according to Clarke, 1886) to which the colour of the mineral is due. A new analysis is given of pure material from the Crescent Mining District, Lincoln Co., Nevada ; this is of a beautiful robin's-egg blue colour, and breaks with a smooth fracture ; under the microscope, it appears to be homogeneous, and there is no evidence of the presence of two substances.

P_2O_5 .	Al_2O_3 .	Fe_2O_3 .	CuO .	H_2O .	Insol.	Total.	Sp. gr.
34.18	35.03	1.44	8.57	19.38	0.93	99.53	2.791

A consideration of this and other trustworthy analyses suggests that the copper is present as an essential constituent of the mineral ; and this is also supported by the fact that finely powdered turquoise dissolves in hydrochloric acid as a whole without discoloration. The new formula, $[\text{Al}(\text{OH})_2, \text{Fe}(\text{OH})_2, \text{Cu}(\text{OH}), \text{H}]_3\text{PO}_4$, represents the mineral as a derivative of orthophosphoric acid with the hydrogen atoms largely replaced by the univalent radicles $\text{Al}(\text{OH})_2$, &c. In some analyses, approximately two-thirds of the hydrogen atoms are so replaced, and the formula becomes $[\text{Al}(\text{OH})_2, \text{Fe}(\text{OH})_2, \text{Cu}(\text{OH})]_2\text{HPO}_4$.

L. J. S.

Analysis of the Thermal Waters of Achkel. By PUAUX (*J. Pharm.*, 1900, [vi], 12, 261—262).—These waters are very similar to those of Hamman-Lif and Bourbonne-les-Bains, and have an average temperature of about 44°. The greater portion of the salts present in the waters consists of sodium chloride, the rest consisting of calcium, magnesium and potassium sulphates, calcium chloride, and calcium carbonate.

H. R. LE S.

Physiological Chemistry.

Effect of Gestation on the Amount of Mineral Matter, especially Phosphoric Acid and Calcium, in Cow's Milk. By A. KORT (*Bied. Centr.*, 1900, 29, 667—668 ; from *Ing. Agr. Gembloux*, 1899, 453—475).—The percentage amounts of mineral matter, and especially of phosphoric acid and calcium, diminish more or less regu-

larly as the time of calving approaches, notwithstanding the decrease in lactation. Colostrum is rich in ash constituents.

During the period of the greatest flow of milk, the percentage amounts of phosphoric acid and calcium are lowest, whilst the total amounts are greatest. The amounts of mineral constituents gradually became normal as the production of milk diminishes, but again decrease towards the middle of the period of gestation.

Normal feeding has practically no effect on the amount of mineral matter in milk.

In the case of herbivorous animals, gestation has no effect on the amounts of phosphoric acid and calcium in the urine; feeding has the predominating effect. As regards carnivorous animals, however, the amount of phosphoric acid in the urine decreases during gestation.

N. H. J. M.

Division of Unfertilised Eggs. By ALBERT P. MATHEWS (*Amer. J. Physiol.*, 1900, 4, 343—347).—The experiments were made on the eggs of *Arbacia*, and show that lack of oxygen, heat (32—33°), and exposure to ether, chloroform, or alcohol for a short time are all followed by karyokinetic nuclear division. The essential basis in all cases appears to be the production of localised areas of liquefaction in the protoplasm, and it is suggested that the centrosome normally plays the part of a liquefying enzyme.

W. D. H.

Influence of Digestion on Animal Heat. By EDWARD T. REICHERT (*Amer. J. Physiol.*, 1900, 4, 397—404).—Experiments on dogs show that the rise of temperature during digestion is due to increase of heat production. The maximum rise is during the fourth hour after a meal or later, but the changes in heat production (determined calorimetrically) and temperature are not proportional, for the greatest increase in heat production occurs during the first hour after feeding. The most marked effects are observed when the diet consists of proteid and fat, next with proteid, and least with fat.

W. D. H.

Gaseous Metabolism of the Submaxillary Gland. II. Absorption of Water. By JOSEPH BARCROFT (*J. Physiol.*, 1900, 25, 479—486).—The 'chorda blood' contains less water than the arterial blood. After the first minute of stimulation, the water lost from the blood exceeds in volume the saliva secreted, and may be measured by multiplying the volume of saliva by a factor the mean value of which is 1.12. In the first half minute of secretion, there is a large flow of saliva, followed in the second half minute by a relatively small flow. In the first half minute the absorption of water from the blood is large; this is diminished in the second half minute.

W. D. H.

Metabolism in Forced Feeding. By W. HALE WHITE and E. I. SPRIGGS (*Proc. Physiol. Soc.*, 1900, xxvii—xxviii).—Observations were carefully made on a woman for 56 days. If all the gain of weight had been proteid, the nitrogen corresponding to it would have been 441.8 grams. But as the nitrogen not accounted for in urine and faeces was 661.04 grams, 219 grams of nitrogen have to be accounted for in some other, at present unexplained, way.

W. D. H.

Metabolism in the Dog before and after removal of the Spleen. By DIARMID NOËL PATON (*J. Physiol.*, 1900, 25, 443—461).—After removal of the spleen there is a more rapid excretion of water after a meal, which probably indicates more rapid absorption. Otherwise there is no essential difference in the course or nature of the metabolism either during fasting or after feeding with the ordinary proteids of flesh, with vegetable food such as oatmeal, or with food rich in nucleins, such as thymus gland. W. D. H.

Absorption of Fat. By EDUARD PFLÜGER (*Pflüger's Archiv*, 1900, 82, 303—380).—Largely polemical. The main conclusion is that fat, like proteid and carbohydrate, undergoes hydrolytic decomposition before absorption, and is never absorbed as emulsified neutral fat. W. D. H.

Nutrition in Summer and Winter in Moderate Climates. By KARL ERNST RANKE (*Zeit. Biol.*, 1900, 40, 288—323).—Experiments on man show that within ordinary ranges of temperature there is no correspondence between a warm temperature and a necessarily more limited supply of food. In summer temperatures of over 20°, the instinctive lessening of appetite is related to pathological conditions induced by the excessive heat. W. D. H.

Properties and Origin of Lymph. By LEON ASHER and FREDERIC W. BUSCH (*Zeit. Biol.*, 1900, 40, 333—373. Compare Abstr., 1899, ii, 165).—The formation of urea from ammonium salts in the liver is accompanied by increased lymph formation: the lymph produced is more concentrated owing to increase of proteid. The formation of glycogen produced by injection of sugar into the portal system is accompanied by increase in lymph formation, but the concentration of the lymph remains constant. The intravenous injection of an assimilable proteid, such as casein, produces also a more abundant lymph which is richer in proteid. Heidenhain's lymphagogues of the first class cause increased liver activity and so lead to increased lymph formation; after intense activity of the liver, the coagulability of the lymph from the thoracic duct lessens. Activity of the pancreas similarly causes increase in lymph formation. These facts are all considered to support the view that lymph formation resembles the physiological process of secretion. W. D. H.

Formation of Glycogen after Feeding on Galactose. By ERNST WEINLAND (*Zeit. Biol.*, 1900, 40, 374—385).—In the rabbit, the administration of galactose leads to the formation of glycogen in the liver. W. D. H.

Urea Formation in the Body. I. Introduction. By WLADIMIR VON GULEWITSCH (*Zeit. physiol. Chem.*, 1900, 30, 523—532). II. **The Occurrence of Arginine in the Spleen.** By WLADIMIR VON GULEWITSCH and A. JOCHELSOHN (*ibid.*, 533—538).—A discussion on the relative importance of the processes of hydrolytic decomposition of nitrogenous matter in the body, and of oxidation in *intra vitam* urea formation introduces a series of papers. However important oxidation may be, there can be little doubt that hydrolysis occurs also in nitro

genous katabolism. Drechsel's well known work on the formation of urea from arginine *in vitro* renders it extremely probable that part, at any rate, of the urea formed in the body may pass through the arginine stage. Hitherto, although arginine has been found in plants, its existence has never been shown in the animal body, and the first step in the series of investigations shows it to be present in the spleen of the ox. Future papers will deal with its fate in the body.

W. D. H.

Lactase of the Pancreas. By ERNST WEINLAND (*Zeit. Biol.*, 1900, 40, 386—391).—The administration of milk increases the production of pancreatic lactase. Feeding on milk-sugar alone does the same thing. This is not due to the milk-sugar or any of its decomposition products passing into the pancreas; but the sugar acts as a stimulus, possibly to the secretory nerves of the organ.

W. D. H.

[**Lecithin in Brain and Milk.**] By ROB. BUROW (*Zeit. physiol. Chem.*, 1900, 30, 495—507).—The lecithin was extracted by means of an ether-alcohol mixture, and estimated from the amount of phosphorus in the extract. In different animals, it was found that the amount of lecithin in the milk varies, its proportion becoming greater as the relative brain weight of the animal increases. The following table gives the principal results:

	Calf.	Dog.	Man.
Relative brain weight	1:370	1:30	1:7
Lecithin of milk in percentage of } proteid	1.40	2.11	3.05

W. D. H.

Relationship of Iron in the Urine and in the Blood. By ADOLF JOLLES and FERDINAND WINKLER (*Chem. Centr.* 1900, ii, 687—688; from *Arch. exp. Path. Pharm.*, 44, 464—476).—The daily excretion of iron in the urine averages 8 milligrams. The iron coefficient, that is, the proportion between the iron in the blood and urine, is 104.6 in health, but sinks in disease, and in anæmia gravis is only 7.2; here the excretion of iron is increased six-fold. In chlorosis, the excretion is normal, but the iron-coefficient falls.

W. D. H.

Diuretic Effects of Sodium Chloride. By WILLIAM H. THOMPSON (*J. Physiol.*, 1900, 25, 487—518).—The intravenous injection of small amounts of an isotonic solution of sodium chloride is followed usually by diuresis which is out of proportion to the volume of fluid injected. This is completed three or four hours after the injection. The excretion of urea and nitrogen is augmented, but the maximum occurs earlier than the maximum excretion of water. The diuresis is not caused by elevation of blood-pressure. A hydremic condition of the blood is produced, but this is not the sole factor in producing the increased flow of urine. A diminution in the urinary chlorides is probably produced by the anæsthetic. The kidney volume corresponds in a general way to urinary outflow; but there are exceptions to this

rule. This is to be explained by the amount of lymph present. Bowman's theory explains urinary secretion better than Ludwig's.

W. D. H.

Diuretic Action of certain Purine Derivatives. By NARZISS ACH (*Chem. Centr.*, 1900, ii, 688 ; from *Arch. exp. Path. Pharm.*, 44, 319—348).—Dimethylxanthine acts on rabbits very markedly as a diuretic, and theophylline and paraxanthine are much more effective than theobromine. Of the monomethylxanthines, 4-methylxanthine acts as a diuretic, whilst heteroxanthine hardly acts in this way at all. Xanthine, isocaffeine, deoxycaffeine, and deoxytheobromine are not diuretics. The presence of methyl groups in the 4:6 and 1:6 positions appears to be of greater importance for diuretic action than in the 1:4 position.

W. D. H.

Action of Phloridzin on the Kidneys. By JULIUS VON KÓSSA (*Zeit. Biol.*, 1900, 40, 324—332).—In spite of what some observers have stated to the contrary, phloridzin does produce a nephritic condition. It also produces fatty infiltration of the liver and muscles. The nearly related pentoside, hesperidin, produces nephritis and albuminuria but not glycosuria.

W. D. H.

Physiological Action of certain Isomeric Hydroxyquinolines. By BÉLA VON FENYVESSY (*Zeit. physiol. Chem.*, 1900, 30, 552—564).—The two hydroxyquinolines, carbostyryl and kynurin, were investigated in rabbits and frogs. Administered by the mouth, the former causes paralysis by a curare-like action on the nerve-endings. The urine contains sugar, and after the removal of this by fermentation, is strongly levorotatory ; the substance to which this was due was crystallised out, and analysis of its potassium salt showed it to be carbostyryl-glycuronic acid. A part (about 25 per cent.) of the drug leaves the body as an ethereal sulphate. Two experiments were made in which the drug was given subcutaneously. One rabbit died ; the urine of the other did not contain the optically active material.

Kynurin given by the mouth has no ill-effects on rabbits, but injected under the skin of frogs it produces much the same paralytic effects and heart-weakening as carbostyryl, although less marked in degree. The urine of the rabbits in this case also contains a levorotatory material, which yields kynurin on decomposition. Elementary analysis of the crystalline material obtained from the urine shows that it is not a compound of glycuronic acid as anticipated.

W. D. H.

Chemistry of Vegetable Physiology and Agriculture.

Gaseous Exchanges between Plants and the Atmosphere. By TH. SCHLOESING, jun. (*Compt. rend.*, 1900, 131, 716—719. Compare Abstr., 1893, ii, 137, 180 ; 1894, ii, 110).—Comparative experiments, made on buckwheat and dwarf nasturtiums cultivated in media

freed from nitrifying organisms show that the plants, under these conditions, readily accommodate themselves to the substitution of ammonium salts for nitrates; buckwheat thrives slightly better on nitrates, whilst ammonium salts seem more favourable to the growth of nasturtiums. During the entire period of development, the plants evolve a volume of oxygen which is greater than that of the carbon dioxide absorbed. This excess of oxygen is derived principally from the reduction of the mineral salts extracted from the soil, and is very appreciably diminished when the nitrates are replaced by ammonium salts.

The quantitative results obtained in these experiments are exhibited in tabular form. G. T. M.

Assimilation of Free Atmospheric Nitrogen by Mycelia in the above-ground portions of Plants. By LORENZ HILTNER (*Bied. Centr.*, 1900, 29, 705—706; from *Centr. Bakt. Par.*, 5, ii, 831—832).—In 1897, A. E. Vogl discovered a fungus in the so-called hyalinic layer of seeds of *Lolium temulentum*. The results of experiments made by the author in which *Lolium italicum* and *L. temulentum* were grown together in sand, with and without addition of potassium nitrate, indicate that in the case of *L. temulentum*, free nitrogen is assimilated.

It was not possible to separate completely the roots of the two varieties of *Lolium*. The results for the above-ground growth (in the pots without nitrate) are as follows (grams):

	Dry matter.	N.
<i>Lolium temulentum</i>	5.173	0.0304
„ <i>italicum</i>	0.974	0.0067

The amount of combined nitrogen in the seed and in the water given to the plants did not exceed 8 milligrams, whilst the roots of the two varieties together contained 7.8 milligrams of nitrogen. In the nitrate pots, there was a gain of 0.068 gram of nitrogen.

N. H. J. M.

Rôle of Oxygen in Germination. By PIERRE MAZÉ (*Ann. Inst. Pasteur*, 1900, 14, 350—368).—The failure of seeds to germinate under water is due to deficiency of oxygen. Whilst the seeds appear to be unchanged, they are in reality undergoing various changes; the hydrolysing diastases, and particularly zymase, are as active as in seeds germinating normally. On the other hand, the oxidations necessary for the elaboration of reserve foods being impossible under these conditions, the embryos remain inert.

Small seeds (cruciferous, for instance) may develop slowly at the expense of their internal atmosphere. Starchy seeds rapidly lose their germinating power, whilst oily seeds are more resisting. There is, however, no reason to suppose that any seeds are capable of resisting prolonged immersion in water.

The weakening of the vitality of submerged seeds is due to the production of toxic compounds, especially aldehyde.

The development of the plant at the expense of the reserve substances of the seed seems to depend on a certain number of diastasic actions,

the equilibrium of which cannot be disturbed without sooner or later causing death.

N. H. J. M.

Diffusion of Enzymes in the Seeds, with Special Reference to the Fat-decomposing Enzymes. By C. LUMIA (*Bied. Centr.*, 1900, 29, 669—673; from *Staz. sper. agrar. ital.*, 1898, 31, 353).—When the endosperm of growing plants was extracted successively with water and ether, the ethereal residue was found to be acid. Seeds similarly treated gave neutral residues. Fat is therefore decomposed in the endosperm during germination.

The results of experiments with *Ricinus communis* show that an aqueous extract of the germinating seeds liberated a considerable amount of acid from ricinus oil, which was added. When the extract was first boiled, the production of acid was comparatively small. Thymol was added in each case.

N. H. J. M.

Microchemical Examination of Aleurone-grains. By ALEXANDER TSCHIRCH and H. KRITZLER (*Chem. Centr.*, 1900, ii, 585—586; from *Ber. deut. pharm. Ges.*, 10, 214—222).—The aleurone-grains of the seeds of a variety of plants were found to consist mainly of globulins, similar to the globulins of animal proteids. The crystalloids contain at least two globulins of different solubility in 1 to 10 per cent. solutions of salts; they are insoluble in concentrated solutions of ammonium sulphate, sodium chloride (with a trace of acetic acid), and potassium dihydrogen phosphate, and either insoluble or sparingly soluble in concentrated magnesium sulphate solution. Aleurone-grains contain also, possibly, small amounts of albumoses.

The globoids contain protein (globulin), calcium, magnesium, and phosphoric acid; they dissolve in concentrated solutions of ammonium sulphate, acidified sodium chloride, and potassium dihydrogen phosphate, and are sometimes sparingly soluble and sometimes insoluble in concentrated magnesium sulphate solution.

The germinating power of seeds probably depends directly on the solubility of the crystalloids in dilute sodium chloride solution. The proteids in old seeds which are insoluble in 10 per cent. sodium chloride solution, but soluble in 1 per cent. sodium carbonate solution, correspond with Weyl's albuminates, and are not identical with Osborne's insoluble modification of globulin.

The oil of the seeds is not present as drops, but is mixed with the cell plasma; the gluten grains are free from oil.

N. H. J. M.

Dependence of the Production of Transitory Starch on Temperature and on the Action of Oxydases. By J. GRÜSS (*Bied. Centr.*, 1900, 29, 685—687; from *Woch. Brauerei*, 1899, 16, 519, and *Centr. Bakt. Par.*, 1899, 5, 775).—Sucrose is the first carbohydrate utilised in the germination of barley, the starch not being used until the embryo reaches a certain stage and is able to furnish the enzymes necessary for rendering the starch available. The rootlet is enclosed in a gum which probably consists of galactans; this contains a liquefying enzyme.

When a hole is bored through a potato the exposed surface soon becomes covered with cork. The latter contains two oxydases, an

α -oxydase and a β -oxydase. The α -oxydase is a carrier of free atmospheric oxygen and is destroyed by prolonged contact with alcohol, or by heating with alcohol for 15 minutes at 50–53°; it dissolves readily in glycerol, and is precipitated with only partial destruction by lead acetate. The β -oxydase liberates loosely combined oxygen. Neither the α - nor the β -oxydase is hydrolytic.

For detecting oxydases, paper soaked in an alcoholic solution of tetramethyl-*p*-phenylenediamine is employed; the dried paper, when moistened and placed on vegetable tissues containing oxydases, causes them to become coloured violet when exposed to air.

Barley contains a substance, *spermase*, which resembles oxydases, except in its extremely slight action on guaiacol; it is destroyed by heating with alcohol at 55–57°. As germination proceeds, the action of the spermase at first increases, then diminishes until it ceases. Probably the cessation is only apparent, the action being masked by reducing substances.

N. H. J. M.

Saps. III. By ALEXANDER HÉBERT (*Bull. Soc. Chim.*, 1900, [iii], 23, 839–842). Compare Abstr., 1896, ii, 494, and 1898, ii, 446).—A specimen of the sap or juice of the vanilla plant from the Congo was found to contain about 4 per cent. of crystallised calcium oxalate, to which the known irritant action of the juice is possibly due. Proteids and reducing substances are also present, but neither alkaloids nor fats could be detected.

N. L.

Plants Containing Zinc. By ERNST FRICKE (*Chem. Centr.*, 1900, ii, 769; from *Zeit. öffentl. Chem.*, 6, 292).—On a meadow near Ramsbeck, Westphalia, which is occasionally flooded by waste liquors containing zinc, and on soil near Bockwiese and Lautenthal which is known to contain zinc, a cruciferous plant very similar to *Arabis Halleri* has been found to flourish. In both cases, the plant contained zinc, and in the latter case the plant substance free from water and sand yielded 1.3 per cent. of ash which contained 0.94 per cent. of zinc.

E. W. W.

Oil and Fat of *Stillingia Sebifera*. By MASSIMO TORTELLI and R. RUGGERI (*Annali del Lab. Centr. delle Gabelle*, 1900, 4, 205–215; and *L'Orosi*, 1900, 23, 289–297).—The seeds of *Stillingia sebifera* contain 20.0 per cent. of fat and 19.2 per cent. of a very mobile, pale yellow oil, having the sp. gr. 0.9432 at 15°/15° and $[\alpha]_D - 3.41^\circ$ at 16°; the other chemical and physical constants have also been determined.

T. H. P.

Genesis of Terpenoid Compounds in Plants. By EUGÈNE CHARABOT (*Ann. Chim. Phys.*, 1900, [vi], 207–288).—A detailed account of work already published (compare Abstr., 1900, i, 363; ii, 101, 241, 361, 362; this vol., i, 38).

G. T. M.

Simultaneous Presence of Sucrose and Gentianose in Fresh Gentian Root. By ÉMILE BOURQUELOT and HENRI HÉRISSEY (*Compt. rend.*, 1900, 131, 750–752. Compare Abstr., 1898, i, 349; Abstr., 1900, i, 511).—Fresh gentian root is shown to contain both sucrose and gentianose, the former being, perhaps, produced by the decompo-

sition of the latter sugar. Full details are given in the paper of the separation and identification of the sucrose. N. L.

Presence of Invertin or Sucrase in Grapes. By V. MARTINAND (*Compt. rend.*, 1900, 131, 808—810).—Invertin was found to be present in crushed grapes which, before maceration, had been carefully sterilised to destroy any enzyme which might be present on the outer surface of the skin. The amount of invertin present is sufficient to invert the whole of the sucrose present in the grapes. The invertin which is found in wine comes from the grape itself, and not from the enzyme which has produced fermentation in the wine. The invertin present in grapes is not so readily oxidisable as that obtained from other sources. It is absent from diseased wines, and from wines which have undergone strong oxidation. H. R. LE S.

Colouring Matter of Beetroot and its Absorption Spectrum. By JULIUS FORMÁNEK (*J. pr. Chem.*, 1900, [ii], 62, 310—314).—Beetroot contains an unstable colouring matter, which shows a yellow absorption band and, when warmed or kept, soon changes into the substance which exhibits the well-known blue and violet absorption bands. R. H. P.

Nitrogen in Peas. By WILHELM JOHANNSEN (*Bied. Centr.*, 1900, 29, 717; from *Tidsskr. Landbr. Plant.*, 1899, 5, 100).—Nitrogen was determined in ten large and in ten small seeds. The following are the average results. Large seeds (450 mg.), $N = 3.35$; small seeds (226 mg.), $N = 3.17$. The average for all the seeds (338 mg.) was $N = 3.26$ per cent. There were only relatively few cases in which the small seeds had a lower, and the large seeds a higher percentage of nitrogen than the average of all the seeds. N. H. J. M.

Manurial Experiments with Hops. By THEODOR REMY (*Bied. Centr.*, 1900, 29, 664—665; from *Bl. Gersten-, Hopfen- u. Kartoffelbau*, 1899).—Experiments with hops in which farmyard manure was applied to soil not particularly deficient in humus-nitrogen decidedly increased the yield without having any marked effect on the quality of the hops. In the case of peat land (a typical East Prussian hop soil) containing 1.97 per cent. of nitrogen, the results showed that dung should only be employed in moderation, being injurious, rather than beneficial, as a source of nitrogen. N. H. J. M.

Cultivation of Olives. By FLAMINIO BRACCI (*Bied. Centr.*, 1900, 29, 673—675; from *Staz. sper. agrar. ital.*, 1899, 32, 161).—The different parts of the olive have the following percentage composition:

	Water.	Organic matter.	N.	Ash.	K ₂ O.	Per cent. in Ash.		
						Na ₂ O.	CaO.	P ₂ O ₅ .
Branches ...	32.5	65.6	1.9	0.75	20.56	11.38	30.94	15.39
Leaves	53.6	43.4	3.0	1.01	18.68	8.51	35.64	7.68
Fruit	52.7	45.5	1.8	0.45	56.30	4.82	5.71	6.55

It is estimated that the following amounts of manurial constituents are lost per hectare per annum (in wood, leaves, and fruit): N, 27.9; K₂O, 37.2; CaO, 13.9; and P₂O₅, 8.8 kilos. N. H. J. M.

So-called Invisible Injury [to Trees] by Smoke. By PAUL SORAUER and EMIL RAMANN (*Bied. Centr.*, 1900, 29, 678—685; from *Bot. Centr.*, 1899, 90, 50—56, 106—116, 156—168, 205—216, and 251—262).—Pine trees, 8—9 years old, in pots were subjected for an hour, in one case every day, and in others every second, third, or fourth day respectively, to the action of sulphur dioxide (0.0022 volume per cent. of the air) obtained by burning a mixture of carbon disulphide and alcohol. According to the frequency of the treatment, the amount of sulphuric acid in the needles was increased by 0.189, 0.112, 0.079, and 0.072 per cent. There was no visible change in the appearance of the needles either in the first or the second year; microscopical examination showed, however, that in many of the needles the chlorophyll substance had undergone changes or was completely destroyed.

Similar experiments were made in which the trees were subjected to the action of hydrogen chloride (0.00386 volume per cent.), obtained by burning a mixture of amyl chloride and alcohol. The amount of chlorine in the needles was appreciably increased, but the increase had no relation, as in the case of sulphur dioxide, to the frequency of the treatment. Less acid was, however, on the whole, absorbed by those plants which were rendered damp by spraying than by the others. Microscopic examination revealed no alteration in the chlorophyll substance. The stronger trees absorbed less acid than the weaker ones.

The results show that hydrogen chloride is less dangerous to pines than sulphur dioxide.

N. H. J. M.

Butter Fat. By ALPH. VAN ENGELER and P. WAUTERS (*Bied. Centr.*, 1900, 29, 666—667; from *Contrib. étude de la graisse du beurre, Brussels*, 1899, pp. 14).—Butter obtained at different periods was examined, as well as the butter from single cows. The rations of the cows included cotton seed meal or sesame cake.

The conclusion is drawn that abnormal butter fat may be produced at all times of the year, and that its formation does not depend on the feeding or on the period of lactation, but on physiological conditions not yet understood. In the authors' experiments, the Reichert-Meissl number varied from 23.3 to 38.5.

N. H. J. M.

Peat. By ARTHUR PETERMANN (*Bied. Centr.*, 1900, 29, 714—715; from *Bul. stat. agron. Gembloux*, 1899, No. 66, 11).—Peat from Herzogenwald was air dried, well mixed, and heated in an iron retort at about 450°. The following amounts of products were obtained from 1000 kilos. of air-dried peat: Coke, 337.5 grams; methyl alcohol, 600 c.c.; acetic acid, 3.058 grams; and tar, 57.675 grams. The tar yielded oil boiling at 0—100°, 100—200°, and 200—300°; 2.5, 12.75°, and 17.00 grams respectively; paraffin, 14.425; and coke, 11 grams. The yield of ammonia was 921 grams, and there was sufficient illuminating gas (from 2 kilos.) to burn with a good flame for 6 hours.

N. H. J. M.

Estimation and Composition of Humus and its Nitrification. By CHARLES RIMBACH (*J. Amer. Chem. Soc.*, 1900, 22, 695—703).—Humus, extracted in the usual manner, was precipitated with a mixture of calcium and magnesium sulphates. The humate (28 grams) was mixed with ignited sand (2 kilos.), which was then inoculated with soil extract and kept at about 25° for two months, water being added when necessary. It was then found that 5.94 per cent. of the humus nitrogen had become nitrified. When soils are extracted with dilute hydrochloric acid, a certain variable amount of humus is dissolved. The amount of nitrogen in the sodium hydroxide extract differs from that in the ammonia extract, and cannot be directly referred to the amount of organic matter in the latter.

In the usual process for determining humus, a certain amount of ammonia (about 5 per cent.) is included in the organic matter, making the results too high. Sodium hydroxide solutions extract more nitrogen than ammonia, and the question still remains, which of the two solvents is preferable. N. H. J. M.

Composition of the Coprogenic Mud of Kanger Lake in Livonia. By MAXIMILIAN GLASENAPP (*Bied. Centr.*, 1900, 29, 665—666; from *Baltische Woch.*, 1899, 40).—The mud is a light grey substance of the following composition (air dried): Water, 7.60; nitrogenous organic matter, 11.75; non-nitrogenous organic matter, 26.34; potassium, sodium, and calcium sulphates, 0.61, 0.66, and 2.67; calcium phosphate and carbonate, 0.37 and 15.86; magnesium carbonate, 5.33; ferric oxide and alumina, 2.88; silica and silicates, 25.93 per cent.

The mud can be obtained in large amounts in dry summers, and is locally useful as a manure. N. H. J. M.

Denitrification and the Action of Farm-yard Manure. By THEODOR PFEIFFER and OTTO LEMMERMANN (*Landw. Versuchs-Stat.*, 1900, 54, 386—462).—The utilisation of the nitrogen in the soil is hindered by an increase in the amount of organic matter as well as by denitrifying bacteria. Manuring with farmyard manure, dung, &c., not only increases the amount of organic matter but acts as a carrier of bacteria.

In pot experiments, the injurious effect of organic matter and denitrifying bacteria was only observed in the case of the first crop, but not afterwards.

When the amount of organic matter in the soil was increased by adding potassium citrate, or when pure cultures of denitrifying bacteria were added, there was a loss of nitrogen in the free state. In the case of farm-yard manure, the production of elementary nitrogen is quite unimportant as compared with other factors which give rise to incomplete utilisation of the nitrogen; this holds good even in pot experiments.

On light sandy soil the utilisation of nitrates is not affected by an application of 800 cwt. of old bullock or horse manure or fresh horse dung. In pot experiments, the same manure gave quite different results, but these have no direct bearing on practical agriculture.

The varying results obtained with different kinds of stable-manure

cannot be attributed either to the differences in the amounts of the different forms of nitrogen, and cannot be explained by denitrification and liberation of free nitrogen. The amounts of non-nitrogenous organic substances, especially xylan, had in these experiments no relation to the nitrogen assimilated. The differences observed would seem to be due to the various degrees of stability of the nitrogen compounds.

When farm-yard manure is improperly kept, the production of available forms of nitrogen may be entirely suppressed, even under conditions most favourable to the decomposition of the non-nitrogenous constituents. This is attributed mainly to the proteolytic ferments being injured, but requires further investigation.

The above conclusions are drawn from the results of a number of pot and plot experiments, which are fully described. N. H. J. M.

Analytical Chemistry.

Estimation of Ozone. By OTTO BRUNCK (*Ber.*, 1900, 33, 2999—3000).—A reply to Ladenburg (*Abstr.*, 1900, ii, 721).

T. M. L.

[**Estimation of Persulphates and Chromium.**] By RODOLFO NAMIAS (*L'Orosi*, 1900, 23, 218—223).—See this vol., ii, 15.

Estimation of Nitric Acid in Water. By N. N. KOSTJAMIN (*Chem. Centr.*, 1900, ii, 878—879; from *Pharm. Zeit.*, 45, 646).—Five c.c. of the sample are slowly mixed with a freshly prepared solution of 1 part of brucine in 3000 parts of sulphuric acid of sp. gr. 1.84 until a permanent rose coloration is formed. The greater the amount of nitrate the less of the reagent will be required. If nitrites should be present, these must be expelled by boiling with dilute sulphuric acid.

A table is given showing the number of c.c. of the reagent required for samples containing from one to twenty milligrams of nitric pentoxide per litre.

L. DE K.

Volumetric Estimation of Phosphorous Acid. By OTTO KÜHLING (*Ber.*, 1900, 33, 2914—2918).—Phosphorous acid may be estimated volumetrically by the aid of potassium permanganate solution but the reaction takes some time for completion. Zinc sulphate is added to the solution of the acid and the liquid is then heated on the water-bath and treated with permanganate solution. The zinc sulphate reacts with the alkali produced from the permanganate, yielding zinc hydroxide which carries down the manganese dioxide rapidly and completely. The titration is either carried out until the liquid remains permanently coloured for 10—15 minutes, or an excess of permanganate is added and the excess is estimated by the aid of potassium dichromate.

ate is added, the liquid heated for 1--1.5 hours, and filtered, the precipitated manganese dioxide being then treated with potassium iodide and sulphuric acid and the liberated iodine estimated with thio-sulphate. The excess of permanganate may also be estimated in the filtrate. A. H.

Destruction of Organic Substances by means of Chromyl Chloride in Toxicological Analysis. By C. PAGEL (*Chem. Centr.*, 1900, ii, 784; from *Pharm. Post*, 33, 489—490).—The apparatus consists of a tubulated retort fitted with a separating funnel and connected with a balloon which is in turn connected with two wash-bottles, of which the first is half filled with water and the second with a 1 per cent. solution of potassium hydroxide. The balloon is cooled by a thin stream of water. The finely divided, dried substance is put into the retort, 30—40 grams of a mixture of two parts of sodium chloride and one part of potassium dichromate are added for every hundred grams of material, and sulphuric acid is gradually introduced through the funnel. On heating, yellow fumes of chromyl chloride are evolved which carry over all the arsenic and most of the antimony and mercury. Altogether 40—50 c.c. of sulphuric acid are used and the heating is continued until the charred mass has become quite clear again. The residue in the retort may contain non-volatile metallic chlorides. The process seems a particularly delicate one for arsenic, and the author has found this to be a normal constituent of some parts of the animal body (spleen, brain, testicles, ovaries, &c.). L. DE K.

Flask for the Estimation of Carbon in Iron and Steel. By HEINRICH GÖCKEL (*Zeit. angew. Chem.*, 1900, 1034).—Koch (Abstr., 1895, ii, 86) has described an apparatus which, with slight modification by Ledebur, has become the recognised apparatus of the Society of German Iron Smelters. The author has made another slight modification to render it still more convenient.

In its new form, the apparatus differs from the previous one by having a wider ground neck into which fits the condenser through which passes a thistle funnel tube reaching to the bottom of the flask; the top of the neck of the flask is expanded, so that it can be filled with water to seal the apparatus after introducing the condenser. The side tube of the flask is placed somewhat higher than before. The acid mixture is poured through the funnel tube which is then sealed by means of a glass rod. At the lower end of the condenser is fitted a small slightly bent hook supporting a little glass bucket containing the sample; by a slight jerk this is made to drop into the acid. L. DE K.

Recognition of Barium Compounds as the Cause of Poisoning. By DIOSCORIDE VITALI (*L'Orosi*, 1900, 23, 260—263).—The detection of barium in the stomach contents or in the matter ejected by vomiting and the determination of the form in which it was administered may be carried out as follows. The material is first examined to see whether it gives a marked alkaline reaction, after which it is filtered and the residue extracted with boiling water so long as the latter becomes alkaline. If now the filtrate has an alkaline reaction and barium

carbonate is precipitated on passing carbon dioxide through it, the poisoning was brought about by barium oxide or hydroxide. If the addition of dilute sulphuric acid to the filtrate from the barium carbonate causes evolution of hydrogen sulphide and precipitation of barium sulphate, barium sulphide must have been taken. To detect barium chloride, nitrate, or acetate, the filtrate from the carbonate is evaporated to small volume and finely divided, pure lithium carbonate added until the liquid gives a persistent alkaline reaction, when it is boiled and filtered and the precipitate washed; the filtrate is evaporated to dryness on the water-bath, the residue extracted with a mixture of equal volumes of strong alcohol and ether, and the alcohol-etheral solution evaporated to dryness. The presence in the solid residue thus obtained, of lithium chloride, nitrate, or acetate shows that the corresponding barium salt was the cause of poisoning. In the event of barium carbonate having been employed, this will have been converted to a small extent into the chloride in the stomach, but as vomiting in general occurs soon after the administration of the barium salt, it will mostly remain as carbonate in the insoluble portion of the stomach contents, and may be detected by treating the latter with hydrochloric acid, which will cause evolution of carbon dioxide and the formation of soluble barium chloride. T. H. P.

Presence of Zinc in Alcohol. By THOMAS ROMAN and G. DELLUC (*J. Pharm.*, 1900, [vi], 12, 265—267).—When alcohol is stored in galvanised iron vessels, a small quantity of the zinc is dissolved.

A chloroform solution of urobilin serves as a very delicate test for zinc, with which it gives a green fluorescence, even when the merest trace of the metal is present. In making the test, it is necessary to mix the chloroform solution with $2\frac{1}{2}$ times its volume of absolute alcohol, in order to prevent the formation of an emulsion.

H. R. LE S.

Volumetric Estimation of Copper as Oxalate, with Separation from Cadmium, Arsenic, Tin, and Zinc. By CHARLES A. PETERS (*Amer. J. Sci.*, 1900, [iv], 10, 359—367).—The process is based on the fact that under certain definite conditions copper may be completely precipitated as normal oxalate. After being thoroughly washed on an asbestos filter, the precipitate may be treated with 5—10 c.c. of dilute sulphuric acid (1:1), diluted with a suitable quantity of water, heated to boiling and titrated with permanganate, or it may be dissolved in 10 c.c. of hydrochloric acid mixed with 0.5 gram of manganous sulphate and titrated with permanganate at 30—50°.

In order to ensure the complete precipitation of the copper, there should be present at least 0.0128 gram of its oxide in 50 c.c. of liquid, containing as nearly as possible 5 c.c. of strong nitric acid; two grams of oxalic acid will completely precipitate the copper after 12—16 hours. Ammonium nitrate interferes with the complete precipitation.

The process is not suited for the separation of copper from bismuth and antimony; cadmium, arsenic, iron, and small amounts of tin do not interfere. In the presence of zinc, the precipitate is slightly con-

taminated with zinc oxalate. Numerous test analyses are given in the paper.

L. DE K.

Estimation of Tungsten in Ores. By FRIEDRICH BULLNHEIMER (*Chem. Centr.*, 1900, ii, 991—992; from *Chem. Zeit.*, 24, 870—871).—The following process is recommended for poor ores. 1—2 grams of the finely powdered sample are fused in a nickel crucible with 4 grams of sodium peroxide and 3 grams of sodium hydroxide, first over a very small and then over a full flame until the bottom of the crucible begins to glow. When the mass has solidified, the crucible is placed while hot in a beaker containing some water and the solution is then transferred to a 250 c.c. flask. If the liquid is coloured green by manganese, it is decolorised by means of hydrogen peroxide. When cold, the liquid is diluted to the mark, and half of the filtrate is mixed with 20 grams of ammonium nitrate. After any silica or stannic acid has deposited, magnesium nitrate is added to precipitate any phosphoric or arsenic acid. After 6 hours, the liquid is filtered, the precipitate washed with ammoniacal water and the filtrate made faintly acid with nitric acid. 20—30 c.c. of mercury solution (200 grams of mercurous nitrate heated with 20 c.c. of strong nitric acid and a little water and then diluted to 1 litre) are added, and after a few hours the liquid is nearly neutralised with ammonia. The precipitate is washed with water containing a little mercurous nitrate and then ignited and weighed. In the presence of much molybdenum, the precipitate should be mixed with ammonium chloride and then be reignited.

L. DE K.

Analysis of Tin and Tin-plated Wares. By V. MAINSBRECOQ, (*Chem. Centr.*, 1900, ii, 743—744; from *Rev. intern. falsific.*, 13, 113—115).—Ten grams of the finely cut up sample are treated in an Erlenmeyer flask with strong hydrochloric acid and left overnight. Any undissolved matter, which may contain arsenic, antimony, and the bulk of the copper, is filtered off and treated with nitric acid, which converts the antimony into trioxide and dissolves the arsenic, which may be precipitated as ammonium magnesium arsenate. The hydrochloric acid solution is oxidised with nitric acid, neutralised with ammonia, again slightly acidified with hydrochloric acid, and precipitated with a strong solution of ammonium nitrate; the filtrate from the stannic hydroxide contains the lead and the remainder of the copper, which are precipitated as sulphides and then separated by the thiocyanate method. The filtrate contains zinc and iron, which are separated by means of ammonia, the zinc being finally weighed as sulphide. Tin and copper are, however, best determined in a separate portion. One gram is dissolved in nitro-hydrochloric acid, the tin precipitated by means of ammonium nitrate as directed, and the copper estimated in the filtrate either by potassium thiocyanate or colorimetrically. Tin-plate is simply dissolved in hydrochloric acid; copper is not likely to be present.

L. DE K.

Sources of Loss in the Estimation of Gold and Silver in Copper Bars, and a Method for its Avoidance. By RANDOLPH VAN LIEW (*Chem. Centr.*, 1900, ii, 992; from *Eng. and Min. J.*, 69, 469, 498).—In order to minimise the loss of gold and silver in

the assay of copper bars, the following method is proposed. One or two assay tons of the turnings is dissolved in the cold in 350 c.c. of water and 100 c.c. of nitric acid of sp. gr. 1.42. After 18—20 hours, a further addition of at most 30 c.c. of acid must be made, and within 24—26 hours the solution will be completed. Any nitrous fumes are expelled by means of a current of compressed air in about 20—30 minutes; sodium chloride is then added. The silver chloride, mixed with the insoluble matter containing the gold, is collected on a filter, care being taken to wash it all down to the bottom. The cone of silver chloride is covered with 4—5 grams of assay-lead and with the filter heated at a temperature low enough to cause reduction of the silver chloride without any volatilisation of the chloride; cupellation &c., is then carried on as usual.

L. DE K.

Assay of Cupriferos Materials for Gold and Silver. By L. D. GODSHALL (*Chem. Centr.*, 1900, ii, 992—993; from *Trans. Amer. Inst. Min. Engin.*, Feb., 1900; *Berg.-Hüttenm. Zeit.*, 59, 454).—When applying the usual dry assay, care should be taken to examine the slags and the used cupel for traces of gold and silver. When the material is very rich in copper, it will be necessary to test for and estimate it in the weighed silver buttons.

The wet assay is best conducted as follows. The sample is dissolved in nitric acid and after being diluted with water, lead acetate and a corresponding quantity of sulphuric acid are added; the precipitated lead sulphate carries down any metallic gold, and after being dried, the precipitate is cupelled as usual. The filtrate is precipitated with a chloride or a bromide, and lead sulphate or bromide precipitated in the solution as before, and the resulting argentiferous deposit also cupelled in the usual manner.

The material may also be dissolved in nitric acid, evaporated with addition of sulphuric acid, and the resulting solution treated for a very short time with hydrogen sulphide. The precipitated copper sulphide carries down any gold and this is then recovered like the silver.

L. DE K.

Waters Contaminated by Cystine. By MARCEL MOLINIÉ (*Compt. rend.*, 1900, 131, 720—721).—The development of a yellow coloration by the action of the mercurichloride of sodium *p*-diazobenzenesulphonate which is not destroyed by sulphurous acid cannot be taken as an indication of the presence of cystine in natural waters, because the same result is obtained with slightly acidified distilled water; on the other hand, the coloration is never produced in neutral solutions (compare Causse, *Abstr.*, 1900, ii, 457, 458).

G. T. M.

Estimation of Iodoform in Dressing Materials. By G. FRERICHS (*Chem. Centr.*, 1900, ii, 785; from *Apoth. Zeit.*, 15, 544. Compare Lehmann, *Abstr.*, 1900, ii, 372, 767).—One or two grams of the material are put into a 250 c.c. Erlenmeyer flask and 10—20 c.c. of alcohol or "spiritus æthereus" are added. Excess of *N*/10 silver nitrate and 10 c.c. of dilute nitric acid are then added, and after 15 minutes the excess of silver is titrated with *N*/10 potassium thiocyanate. Several

determinations should be made to see whether the iodoform is equally distributed over the whole of the material. L. DE K.

Estimation of Prussian Blue in Spent Gas Purifying Material. By A. O. NAUSS (*Chem. Centr.*, 1900, ii, 785—786; from *J. Gasbel.*, 43, 696—697).—Ten grams of the sample are repeatedly shaken in a half-litre flask with 50 c.c. of 10 per cent. sodium hydroxide. After 15 hours, the mixture is diluted to 505 c.c. and filtered. Fifty c.c. of the filtrate are added to 10 or 15 c.c. of a hot solution of iron alum (200 grams to 1 litre of water and 100 grams of sulphuric acid) and the whole is heated until the peculiar sweet odour has disappeared; the precipitate is filtered off and washed in a hot water funnel and then heated for a short time together with the filter with a definite volume of $N/50$ sodium hydroxide. The excess of alkali is then titrated with $N/50$ acid until a permanent pale greenish-yellow coloration is observed.

To estimate cyanogen in gases, 100 litres of the gas are passed through an absorption flask containing 20 c.c. of ferrous sulphate (1:10) and 20 c.c. of potassium hydroxide (1:3) and then through a second flask containing 10 c.c. of the mixture. The contents of the flasks are emptied into a half-litre flask, a little more potassium hydroxide and ferrous sulphate, and 1 gram of lead carbonate, to remove hydrogen sulphide, are added, and the whole is boiled for a few minutes. When cold, it is made up to 505 c.c. and 50 c.c. are titrated as directed. One c.c. of $N/50$ alkali = 0.0007794 gram of cyanogen. L. DE K.

Detection of Methyl Alcohol in Mixtures. By S. P. MULLIKEN and HEYWARD SCUDDER (*Amer. Chem. J.*, 1900, 24, 444—452. Compare Abstr., 1899, ii, 388).—Jandrier (Abstr., 1900, ii, 52) has recommended the use of gallic acid instead of resorcinol for the detection of methyl alcohol, since he found that the colour reaction of the former reagent with formaldehyde is much more delicate than that of the latter, and is less likely to be obscured by coloration occasioned by the simultaneous presence of other aldehydes.

The authors find that this modification of their test for methyl alcohol is inadmissible, since many other organic substances yield traces of formaldehyde on oxidation, which would not be detected by resorcinol but give the colour reaction with gallic acid owing to its greater delicacy. A number of precautions are mentioned which should be adopted before applying the resorcinol test, in order to remove substances from the solution which could prevent or obscure the appearance of the characteristic rose-red ring, and a method of applying the test in the presence of much ethyl alcohol is described in detail. E. G.

Colour Reaction of Alcohol. By R. GRASSINI (*L'Orosi*, 1900, 23, 224—225 and 297—298).—If a dilute solution of cobalt chloride, the concentration of which is not less than 0.5 per cent. and is best about 5 per cent., is mixed with potassium thiocyanate solution and a layer of alcohol is poured on to the liquid, which is then gently shaken so that the two strata do not mix, the alcohol assumes a beautiful azure-blue colour which is most intense at the surface of separation.

This reaction is not disturbed by the presence of nickel salts except when the ratio of cobalt to nickel is extremely small; the coloration, is, however, destroyed by hydrogen peroxide. If ether is used in place of alcohol, no coloration is obtained, so that the reaction may be used as a means of detecting the presence of alcohol in ether, which, if it contains 5 per cent. of added alcohol gives a marked coloration.

T. H. P.

Estimation of *m*-Cresol in Cresol Mixtures. By HUGO DITZ (*Zeit. angew. Chem.*, 1900, 1050—1052).—Raschig's process (Abstr., 1900, ii, 694) is not applicable when the mixture contains more than 10 per cent. of phenol. The sample should be suitably diluted with a mixture containing no phenol but a known quantity of *m*-cresol. In Raschig's process, the *o*-cresol and *p*-cresol are oxidised to oxalic acid; should this reaction be quantitative, it might prove of great value.

If, however, phenol is entirely absent, the author thinks that the assay may be more conveniently effected by the bromine process proposed by himself and Cedivoda (Abstr., 1900, ii, 54).

L. DE K.

Detection of Starch-Sugar in Wine. By ED. DELLE (*Chem. Centr.*, 1900, ii, 744; from *Rev. intern. falsific.*, 13, 131—132).—Tony-Garcin's process is recommended. One hundred c.c. of the sample are shaken with 30 grams of animal charcoal and, after 2 hours, filtered. Normally fermented wine then shows a rotation of about $+13^\circ$. If the decolorised wine contains less than 2 grams of reducing sugar per litre and has a rotation of more than $+13'$ before and after inversion, the presence of starch-sugar is proved. If more sugar is present, the test becomes uncertain.

L. DE K.

Estimation of the true percentage of Starch in Potatoes. By GEORG BAUMERT and H. BODE [with A. FEST] (*Zeit. angew. Chem.*, 1900, 1074—1078, 1111—1113).—After reviewing earlier processes, the authors have finally adopted the following method: 3 grams of the finely ground, air-dried potato are stirred at intervals in a porcelain beaker with 50 c.c. of cold water for an hour, the liquid is poured off as completely as possible through a small asbestos filter, and the latter returned to the beaker. Fifty c.c. of water are added, the beaker is closed with a lid and heated for three hours and a half in a Soxhlet digester at a pressure of 3 atmospheres. After cooling, the contents of the beaker are rinsed with 150—200 c.c. of boiling water into a 250 c.c. flask and boiled for 10 minutes; when cold, the liquid is made up to the mark and filtered. 100—200 c.c. of the filtrate are mixed with 10—20 c.c. of aqueous sodium hydroxide (100 grams per litre) and from the clear and stable solution, 25 c.c. are taken and mixed with 100 c.c. of commercial absolute alcohol, about 1 gram of fine asbestos being added in order to facilitate the separation of the starch. The precipitate is now collected on a Soxhlet asbestos filter-tube and washed by means of the suction-pump with 80 per cent. alcohol. The starch is then dissolved by means of about 3—5 c.c. of 5 per cent. hydrochloric acid, reprecipitated with 25—30 c.c. of commercial absolute alcohol and again collected on the filter; it is then

washed first with 80 per cent. alcohol, then with absolute alcohol, and finally with ether. After drying to constant weight at 120–130° in a current of air, the tube is weighed; it is then ignited in a current of air or oxygen and reweighed, when the loss represents the amount of starch. On account of the dilution caused by the alkali, it should be multiplied by 1.1.

In order to obtain the percentage of starch in the raw potatoes, the following formula is applied, $s = 100(v \times 1.1)/0.3 \times l/f$, in which f represents the weight of the raw potatoes, l the weight of the air-dried mass, and v the loss on ignition. Further experiments have conclusively shown that the loss on ignition really represents pure starch.

L. DE K.

New Process for the Estimation of Glycogen. By GEORG LEBBIN (*Chem. Centr.*, 1900, ii, 880–881; from *Zeit. öffentl. Chem.*, 6, 325–327).—Twenty grams of horse flesh or liver are treated in a porcelain dish with 90 c.c. of water and 10 c.c. of 15 per cent. potassium hydroxide and heated over wire gauze until completely dissolved, when the whole is evaporated down to 30–35 c.c. After diluting to exactly 50 or 100 c.c. and filtering through glass wool, 25 c.c. are mixed with 50 c.c. of a mixture of 90 parts of alcohol and 10 parts of 40 per cent. potassium hydroxide. The precipitated crude glycogen is left overnight, collected on a filter and washed with alkaline alcohol. The filter is perforated and the contents are washed into a 100 c.c. flask with 80 c.c. of boiling water. The flask is well shaken, and when cold the contents are neutralised with 10 per cent. hydrochloric acid using tincture of litmus as indicator. After adding 3–4 more drops of the acid, 5–10 c.c. of Brücke's reagent are added, the liquid diluted to the mark and filtered. Fifty c.c. of the filtrate are mixed with 75 c.c. of 95 per cent. alcohol, the precipitate is collected the next morning on a tared filter, and washed first with alcohol and then with ether. After being dried and weighed, the filter is burnt and any ash allowed for.

L. DE K.

Estimation of Acetic Acid. By V. DELFINO and M. MIRANDA (*Chem. Centr.*, 1900, ii, 1038; from *Mon. Sci.*, [iv] 14, ii, 696).—The solution of the acetic acid (? acetate) is boiled with an excess of ferric chloride. The resulting ferric acetate is decomposed into acetic acid and ferric hydroxide which then becomes anhydrous and adheres firmly to the sides of the beaker; it is dissolved in warm sulphuric acid, and reduced by means of a strip of silver foil. After removing the silver from the solution by means of hydrochloric acid, the iron is titrated as usual.

L. DE K.

Acidimetric Estimation of Protocatechuic Acid. By HENRI IMBERT (*Bull. Soc. Chim.*, 1900, [iii], 23, 832–834).—According to Massol (*Abstr.*, 1900, i, 600), protocatechuic acid crystallises in yellow needles melting at 199° and is neutralised by 1.5 mols. of alkali when phenolphthalein is used as the indicator. The author now describes experiments to confirm his former statement (*Abstr.*, 1900, i, 226), that protocatechuic acid is monobasic towards phenolphthalein, although

the end point is somewhat obscure. Moreover the acid employed was colourless, as it is usually stated to be, and melted at 194—195°.

N. L.

New Method for the Detection of "Saccharin" and Salicylic Acid alone or in presence of each other. By E. RIEGLER (*Chem. Centr.*, 1900, ii, 880; from *Pharm. Centr.-Halle*, 41, 563—564).—0.01—0.02 gram of "saccharin" is dissolved in 10 c.c. of water and 2 drops of 10 per cent. sodium hydroxide and put into a separating funnel. Solution of *p*-diazonitroaniline is added drop by drop with constant shaking until the greenish-yellow colour of the liquid has disappeared. After shaking with 10 c.c. of ether, the aqueous layer is removed, and 20—30 drops of 10 per cent. sodium hydroxide are added. At the place of contact between the ether and the soda, a fine green ring is formed; on shaking, the ether turns green and the alkali yellowish-brown. On removing the aqueous layer and adding 5 c.c. of strong ammonia, this turns a beautiful green, whilst the ether is decolorised. Under the same circumstances, salicylic acid first shows an intensely red ring, then a red aqueous but colourless ethereal layer which remains colourless when treated with ammonia, the latter turning red.

If 0.02—0.03 gram of a mixture of "saccharin" and salicylic acid is treated in the same manner, there is obtained first a red, somewhat brownish, ring, then a green ethereal, and a red aqueous solution; on addition of ammonia, a colourless ethereal and a violet ammoniacal layer. The colour of the latter varies in shade according to the respective amounts of the two substances.

The reagent is prepared by dissolving 2.5 grams of *p*-nitroaniline in 25 c.c. of water and 5 c.c. of sulphuric acid. Twenty-five c.c. of water and a solution of 1.5 grams of sodium nitrite are added, and the whole is diluted to the mark.

L. DE K.

Estimation of "Saccharin" in Beverages. By ED. DELLE (*Chem. Centr.*, 1900, ii, 744—745; from *Rev. intern. falsific.*, 13, 121—122).—In the absence of salicylic acid, 50—100 c.c. of the liquid free from alcohol are acidified with phosphoric acid and shaken with ether, or better with a mixture of ether and light petroleum. The ethereal liquid is evaporated, and the residue carefully fused with potassium hydroxide. The fused mass is dissolved in water, the liquid acidified with acetic acid, and the salicylic acid formed extracted with benzene. The weight of the salicylic acid multiplied by 0.77 equals the "saccharin." It may also be estimated colorimetrically by means of ferric chloride.

L. DE K.

Acidity of Milk. By PAUL VIETH and M. SIEGFELD (*Chem. Centr.*, 1900, ii, 922; from *Milch Zeit.*, 29, 593—597).—As the result of a long series of experiments, the authors state that the natural acidity of milk as found by titration with barium or sodium hydroxide with phenolphthalein as indicator is subject to serious variation.

L. DE K.

Determination of the Specific Heat of Fats. By VANDEVYVER-GRAU (*Chem. Centr.*, 1900, ii, 923—924; from *Ann. Chim. anal. appl.*, 5, 321—323).—Pure tristearin has, at -6°_a a fairly constant specific

heat of 0.336. This increases at 10°, 20°, 30°, and 40° to 0.397, 0.409, 0.449, and 0.501, and is at 50° 0.510. At 50° to 55°, the edges of small particles of tristearin begin to soften, and the specific heat quickly rises to 1.3—1.4. Palmitin shows a similar curve, the specific heat varying from 0.330 at -7° to 0.478 at +60°, and more than 1 at 3—4° below the melting point, 66.5°. Other fats behave in the same manner. The author considers the determination of the specific heat of fats, if not impossible, at least extraordinarily difficult, as the heat of fusion causes an elevation of temperature.

L. DE K.

Estimation of Fat in Finely Powdered Substances, particularly in Cocoa and Cocoa Mixtures. By P. WELMANS (*Chem. Centr.*, 1900, ii, 786—787; from *Zeit. öffentl. Chem.*, 6, 304—314).—Five grams of the material are put into a separating funnel and shaken with 100 c.c. of ether saturated with water for a few minutes; 100 c.c. of water saturated with ether are then added, and the whole is again vigorously shaken until a complete emulsion has formed. When the ether has sufficiently separated, 50 or 25 c.c. are pipetted off, the ether is distilled off, and the residual fat weighed. In calculating, it must be remembered that the total volume of the ethereal layer is not 100 c.c., but 100 c.c. *plus* the volume of the fat; the sp. gr. of cocoa fat may here be taken as 1.

Bonnema's tragacanth method (*Abstr.*, 1899, ii, 822) is also serviceable if due correction is made for the volume occupied by the fat.

L. DE K.

Absolute Iodine Absorption Number of Fats. By MASSIMO TORTELLI and R. RUGGERI (*Annali del Lab. Chim. Centr. delle Gabelle*, 1900, 4, 191—204; *L'Orosi*, 23, 109—122).—The authors ascribe the varying values obtained for the absolute iodine absorption number of one and the same fat by Wallenstein and Finck's method (*Chem. Zeit.*, 1894, 18, 1189—1191), to (1) the use of too small a quantity of material, and (2) a slight oxidation of the liquid fatty acids. These disturbing influences are avoided in the following process. Twenty grams of the oil or fat are saponified with alcoholic potassium hydroxide and afterwards converted into the lead soap, which is washed with 200 c.c. of hot (not boiling) water three times in succession, allowed to cool, dried between filter paper and heated in a reflux apparatus on a water-bath with 220 c.c. of ether for 20 minutes. The flask is then cooled in a mixture of ice and water, and maintained at a temperature of 8—10° for 2 hours, after which the liquid is filtered through a pleated filter into a 200 c.c. flask, made up to volume with pure ether, and the stoppered flask left all night in flowing water. The clear ethereal solution, filtered if necessary, is next removed to a separating funnel in which the soluble lead salt is decomposed by 150 c.c. of 20 per cent. hydrochloric acid; after vigorous shaking, the two layers are allowed to separate, and the lower aqueous liquor, together with the lead chloride, run off from the funnel. This is repeated with another 100 c.c. of the acid, after which the ethereal solution is washed twice with 150 c.c. of distilled water, filtered, and distilled until 40—50 c.c. remain. The residue is then placed in a 100 c.c. flask immersed to its neck in a water-bath which is heated to boiling while

a current of carbon dioxide is passed through a narrow tube bent at a right angle and drawn out nearly to a point, and reaching almost to the bottom of the flask. After an hour's heating the flask is removed from the bath, and 8—15 drops (according as the oil contains more or less cotton seed oil or other drying oil), neglecting the first few, aspirated into a tared flask, and the iodine number determined in the usual way.

A large number of fats and oils have been examined by this method, the values obtained being greater, and nearer to the theoretical values, than those given by any process previously proposed.

T. H. P.

Solidification Point of Fatty Acids. By R. MORESCHINI (*Annali del Lab. Centr. delle Gabelle*, 1900, 4, 293—302. Compare Abstr., 1900, ii, 465).—The true solidifying point of a mixture of fatty acids obtained from soap may be found as follows. A test-tube 22—25 mm. wide is fixed by means of a stopper in a cylindrical glass vessel containing air having an initial temperature about 15° lower than the required solidifying point. About 20 grams of the mixed acids are fused and poured into the test-tube, the change of temperature being noted. As soon as the rate of cooling shows signs of slackening, the mass is subjected to vigorous stirring, this being kept up as long as the temperature continues to fall. After a time the mercury begins to rise and reaches a maximum at which it remains motionless for some two minutes; this maximum represents the true solidification point.

T. H. P.

Modification of Welman's Reaction. By THEODOR GEUTHER (*Chem. Centr.*, 1900, ii, 879—880; from *Zeit. öffentl. Chem.*, 6, 328—329).—The author prepares the reagent by pouring 25 c.c. of water on to 5 grams of powdered sodium phosphotungstate and then adding at once 30 c.c. of pure nitric acid of sp. gr. 1.39. This reagent keeps for about a year. To apply the test, 5 grams of the filtered lard are put into a tared test-tube, 3 grams of pure chloroform are introduced, and then 20 drops of the reagent. After thoroughly shaking, the tube is put aside and the coloration observed within two minutes; colorations forming after two minutes should be ignored. The presence of only 5 per cent. of vegetable oil betrays itself by a plain, dark-green coloration. A yellowish-green coloration may be due to stale or rancid lard.

L. DE K.

Brein's Reaction for Sesamé Oil. By ALB. J. J. VANDEVELDE (*Chem. Centr.*, 1900, ii, 783; from *Bull. Assoc. Belg. des Chimistes*).—A criticism of Brein's process (Abstr., 1899, ii, 824). Light petroleum should on no account be used in this test as it also gives the reaction, particularly if it has a high boiling point. It follows that the reaction is not due to nitrogenous matters as suggested by Breinl.

L. DE K.

Modification of Hübl's Method of Estimating the Acid and Saponification Numbers of Wax. By OTTO EICHORN (*Zeit. anal. Chem.*, 1900, 39, 640—645).—The difficulty of saponifying wax, especially Russian wax, may be obviated by dissolving it in amyl alcohol. For estimating the free acids, 6 grams of wax are covered

with 60 c.c. of pure amyl alcohol in a conical flask, and heated on an asbestos plate to boiling. Phenolphthalein is then added, and the titration made with *N*/10 alcoholic potash, which is added until the red colour disappears slowly. The liquid should be kept warm enough to prevent separation of the wax, and the titration should be finished at about 60°, higher temperatures being avoided near the end to prevent risk of saponification. The acid values so obtained are lower than those hitherto accepted. For the saponification, 5 grams are dissolved in 60 c.c. of amyl alcohol, mixed with 25 c.c. of *N* alcoholic potash, the mixture gently boiled for half an hour, and titrated back with *N*/2 hydrochloric acid, after adding phenolphthalein. As soon as the solution has become colourless, the flask is heated until the liquid separates into two layers, and the addition of acid is continued until the lower, aqueous layer remains yellow even on long heating. A little water (10—25 c.c.) may be added to render the change more distinct. A blank experiment, conducted in the same manner, is indispensable. The presence of ceresin or paraffin does not interfere in any way.

M. J. S.

Analysis of Fruit Essences. By GUIDO FABRIS (*Annali del Lab. Chim. Centr. delle Gabelle*, 1900, 4, 41—141).—A large number of experiments have been made on the methods of detecting the common adulterants of oil of lemons. The results show that there is no absolutely certain way of determining the presence of extraneous substances, although much can be learnt by the methods proposed by Schimmel & Co. and by Soldaini and Bertè which make use of fractional distillation and measurements of specific rotation. Other tests such as colour reactions and determination of physical constants, which are useful in some cases, are also considered.

The addition of oils, resins, or balsams to oil of bergamot increases both its density and the residue left on evaporation, whilst oil of turpentine produces a diminution in the rotatory power and in the amount of esters. The admixture of lemon or orange oil with oil of bergamot increases its specific rotation and lowers its density, the amount of esters and the residue left on evaporation.

Methods for examining sweet and bitter orange oils and oil of mandarins are also referred to.

T. H. P.

Valuation of Lemon Oil. By J. WALTHER (*Chem. Centr.*, 1900, ii, 903; from *Pharm. Centr.-H.*, 41, 585—588. Compare *Abstr.*, 1900, ii, 173, and Schimmel & Co.'s *Geschäftsber.*, April, 1900).—In the author's method of testing lemon oil, the sodium hydrogen carbonate should be added to the mixture of lemon oil and hydroxylamine hydrochloride in fine powder, so that it is gradually dissolved during the digestion and decomposes the hydrochloride; 80 parts of the carbonate are required for about 70 of hydroxylamine hydrochloride. The end reaction with methyl-orange is described in the original paper and numerous analyses are quoted.

E. W. W.

Estimation of Carvone in Ethereal Oils. By J. WALTHER (*Chem. Centr.*, 1900, ii, 970; from *Pharm. Centr.-H.*, 41, 613—616).—The quantity of carvone in ethereal oils is estimated by a method similar to that used for lemon oil (*Abstr.*, 1900, ii, 173) 2—5 grams

of the oil are mixed with 10 grams of a freshly-prepared solution of hydroxylamine hydrochloride (2 : 3), 25 c.c. of alcohol free from aldehyde, and 2 grams of sodium hydrogen carbonate, and the mixture gently boiled for half an hour. To the cold solution, 6 c.c. of hydrochloric acid of sp. gr. 1.12 are added, the volume made up to 500 c.c., and the unused hydroxylamine determined in 25—50 c.c. of the filtered liquid. The standard solution of alkali should be free from carbon dioxide. Three samples of caraway-seed oil of sp. gr. 0.913 at 18°, 0.907 at 19°, and 0.893 at 15° were found to contain 52.5, 48.5, and 10.0 per cent. of carvone respectively; a curled-mint oil of sp. gr. 0.932 at 18° contained 51 per cent. and another of sp. gr. 0.887 at 20°, 16 per cent. of carvone.

E. W. W.

Acid and Saponification Numbers of some Copals. By WALTHER LIPPERT and H. REISSIGER (*Zeit. angew. Chem.*, 1900, 1047—1050).—The following varieties of copal have been tested; Angola copal, Angostura copal, Benguela copal, Brazil copal, Cameroon copal, Kauri gum, Dammara resin, and Madagascar, Zanzibar, Manilla, and Sierra Leone copals. The results have been duly tabulated.

The acid number is estimated by direct titration. One gram of the finely powdered copal is treated for a few hours with 10 c.c. of chloroform, 25 c.c. of alcohol are added, and the whole is gently warmed; if no solution takes place, a mixture of equal parts of ether and alcohol should be tried. Dichlorohydrin, which has been proposed as a universal solvent for resins, does not answer for copals. When cold, the acidity is taken with $N/2$ alcoholic potash using phenolphthalein as indicator.

The saponification number was estimated in the usual manner by heating with excess of standard alcoholic potash; the use of chloroform is, of course, excluded here. Henriques' cold saponification process does not work well with copals.

L. DE K.

Detection and Estimation of "Dulcin" (Phenetolecarbamide) in Articles of Food. By J. BELLIER (*Chem. Centr.*, 1900, ii, 822; from *Ann. Chim. anal. appl.*, 5, 333—337).—Lemonades or syrups, after dilution with water, are rendered alkaline with ammonia and shaken with ethyl acetate. In testing wine, 200 c.c. of the sample are treated with 2 grams of mercuric acetate and a little ammonia, and the filtrate is then shaken with 50 c.c. of ethyl acetate. When dealing with beer, 200 c.c. are mixed with 2—3 grams of sodium phosphotungstate and 10—20 drops of sulphuric acid, and the filtrate is shaken with 50 c.c. of ethyl acetate, after rendering alkaline with ammonia. In either case, the solution in ethyl acetate is evaporated to dryness and the residue dissolved in a little sulphuric acid and mixed with a few drops of strong solution of formaldehyde. On adding water, a flocculent precipitate is formed which after 24 hours may be collected, washed, dried, and weighed; its weight represents that of the "dulcin." It may be further identified by Jorissen's reaction.

L. DE K.

The Constituents of Digitalis and their Toxicological Detection. By DIOSCORIDE VITALI (*Chem. Centr.*, 1900, ii, 881; from *Boll. Chim. Farm.*, 39, 597—602).—When testing meat which had

been purposely poisoned with digitalis, the author was only able to detect digitoxin. The meat is extracted with dilute alcohol, the alcohol evaporated, and the residual liquid treated first with lead acetate and then with sodium sulphate. The filtrate, after being rendered alkaline with ammonia, is shaken with chloroform, and from this the digitoxin is precipitated by adding 20 times its volume of a mixture of 1 part of ether and 7 parts of light petroleum. After a further purification with alcohol and ether, the digitoxin gives the reaction with Keller and Kiliani's reagent very distinctly. L. DE K.

Isolation and Estimation of Colchicine. By ALBERT B. PRESCOTT and HARRY M. GORDIN (*Chem. Centr.*, 1900, ii, 784—785; from *Apoth. Zeit.*, 15, 521—522).—Twenty-five grams of powdered colchicum corm or seeds are extracted in a Soxhlet apparatus for 2 hours with 95 per cent. alcohol; the alcohol is distilled off, the oily residue rinsed with about 10 c.c. of hot water in a small separating funnel, and then shaken with 2—3 c.c. of light petroleum. After 15—20 minutes, the oily layer floats on the aqueous liquid. Without filtering, the latter is drawn off into a 100 c.c. flask, the stem of the funnel is rinsed with a little water, and the oily matter is again shaken with 10 c.c. of water. The whole is now put into a small dish, the light petroleum is removed by gently warming, and the contents are again transferred to the funnel and once more shaken with 2—3 c.c. of light petroleum; by this repeated treatment, the whole of the alkaloid is removed from the oil. The turbid aqueous solution is diluted to 100 c.c., 1—2 grams of talc are added, and after shaking it is passed through a dry filter.

The alkaloid may be estimated gravimetrically by first removing the water by means of a current of air, and finally drying the residue in a vacuum or over sulphuric acid. Volumetrically, it may be estimated by boiling it for 2 hours in a reflux apparatus with $N/40$ potassium hydroxide, and titrating the excess of the latter with $N/40$ hydrochloric acid.

L. DE K.

Analysis of Quinine Glycerophosphate. By LÉON PRUNIER (*J. Pharm.*, 1900, [vi], 12, 309—312).—The phosphoric acid in quinine glycerophosphate cannot be estimated by calcination and subsequent oxidation with nitric acid, as the carbon produced during calcination reduces the phosphoric acid and a loss of phosphorus occurs. Quinine is not completely precipitated from quinine glycerophosphate by alkalis in the cold. The following method of analysis gives accurate results:—the quinine glycerophosphate is dissolved in dilute nitric acid (1:10), a solution of sodium hydroxide added and the precipitated quinine filtered off. The filtrate is boiled for some time, when the remainder of the quinine is precipitated and may be removed by extraction with ether or chloroform. The mother liquor from the ethereal or chloroform extraction is then mixed with a large excess of nitric acid together with 2—3 grams of potassium nitrate, evaporated to dryness and calcined to a white ash, care being taken that sufficient nitric acid is present to avoid the presence of any free carbon during calcination. The phosphoric acid present in the residue may then be estimated by any of the usual methods.

H. R. LE S.

Analytical Chemistry of the Alkaloids. IV. Action of Bromine on Strychnine and Brucine. By KARL KIPPENBERGER (*Zeit. anal. Chem.*, 1900, 39, 609—627).—By acting on an acid solution of a strychnine salt with an excess of bromine water, a gradual substitution of bromine for hydrogen takes place; the monobromoderivative is formed almost instantly, in the course of an hour di- and tri-bromostrychnine are formed, whilst the substitution of more hydrogen atoms only takes place after several hours, and in the course of 12 hours 16—17 atoms of bromine are taken up, with formation of strychnine perbromide. The presence of sodium chloride greatly accelerates the reaction. Brucine salts behave in a similar manner.

When moderate amounts of potassium bromide are present, yellow, nearly insoluble, monobromostrychnine hydrobromide perbromide, $C_{21}H_{21}O_2N_2Br.HBr.Br_2$, is rapidly formed together with a little of the dibromo-compound; the presence of larger amounts of potassium bromide restricts the internal substitution. In no case could more than 2 atoms of bromine be introduced into the molecule.

Brucine forms a similar hydrobromide perbromide, but in consequence of its solubility in water, especially in the presence of acids, being greater than that of the strychnine compound, there is a greater tendency for the exterior atoms of bromine to effect substitution in the brucine molecule. The presence of both sodium chloride and potassium bromide favours the additive and hinders the substitutive reaction. The bromobrucine compounds exhibit a rose-red colour. However large the excess of bromine used, no perbromide containing more than two atoms of additive bromine could be obtained. M. J. S.

New Test for Gelatin and Isinglass. By OTTOMAR HENZOLD (*Chem. Centr.*, 1900, ii, 744, from *Zeit. öffentl. Chem.*, 6, 292—293).—Fruit jellies in which gelatin is suspected are boiled with water, the hot liquid is filtered, and a portion of the filtrate is mixed in a test-tube with an excess of solution of potassium dichromate (1:10). The mixture is again heated to boiling, then rapidly cooled and mixed with 2—3 drops of sulphuric acid. Gelatin gives a white, finely divided precipitate which becomes sticky after some time; vegetable jellies such as agar-agar, Iceland moss, and carrageen give no precipitate. L. DE K.

Artificial Silk and its Distinction from the Natural Product. By A. SOLARO (*Annali del Lab. Chim. Centr. delle Gabelle*, 1900, 4, 503—527).—Chemical and microscopical methods are given for distinguishing natural silk from the artificial preparations having a basis of nitrocellulose or gelatin. T. H. P.

Estimation of Humus. By CHARLES RIMBACH (*J. Amer. Chem. Soc.*, 1900, 22, 695—703).—See this vol., ii, 37.

General and Physical Chemistry.

Lamps for Spectra. II. By ERNST BECKMANN (*Zeit. physikal. Chem.*, 1900, 35, 443—458).—The paper contains a large number of practical details of the apparatus previously described (Abstr., 1900, ii, 701). For the appreciation of these, reference must be made to the original, with its numerous illustrations. J. C. P.

Action of Heat on the Absorption Spectra and Chemical Constitution of Saline Solutions. By W. NOEL HARTLEY (*Sci. Trans. Roy. Dubl. Soc.*, 1900, 7, [ii], 253—312).—The author has examined the absorption spectra of nickel, copper, chromium, cobalt, uranium, and didymium salts, as well as that of potassium permanganate. The changes in the spectra accompanying dilution and rise of temperature were specially noted. The author's conclusions are summarised as follows. When a definite crystalline hydrate dissolves in a solvent which is not water, and is without chemical action on it, the molecule of the salt remains unchanged in chemical composition. In any series of salts which are anhydrous, and do not form well-defined crystalline hydrates, the action of heat up to 100° does not cause alteration in their absorption spectra, beyond that which is usual with substances which undergo no chemical change by such rise of temperature. The change is usually an increase in the intensity of the absorption, or a slight widening of the absorption bands. As a rule, crystalline metallic salts in which water is an integral part of the molecule dissolve in water at the ordinary temperature without dissociation of the molecule. Crystallised hydrated salts, dissolved in a minimum of water at 20°, undergo dissociation by rise of temperature. The extent of the dissociation may proceed as far as complete dehydration of the compound, so that more or less of the anhydrous salt may be formed in the solution. The most stable compound which can exist in a saturated solution at 16° or 20° is not always of the same composition as the molecule of the crystallised solid at the same temperature, since the solid may undergo partial dissociation from its water of crystallisation when the molecule enters into solution. Saturated solutions of deliquescent salts combine with water, when diluted, to constitute molecules of more complex hydrated compounds in such solutions. When a saturated solution of a coloured salt undergoes a great change of colour on dilution, or any remarkable change in its absorption spectrum due to the same cause, the dilution is always accompanied by a considerable development of heat.

J. C. P.

Dielectric Constants of Pure Liquids. By B. BERNARD TURNER (*Zeit. physikal. Chem.*, 1900, 35, 385—430).—The author has made an exhaustive study of Nernst's method of determining dielectric constants (Abstr., 1894, ii, 437), and introduced several alterations. The various means of eliminating the external capacity are compared, and the use of that method recommended in which the capacity of the

trough employed is measured (1) with rod and condenser plate, (2) with rod alone. The ebonite lid of the trough is found to be a source of weakness, and is replaced by a glass lid of suitable construction. For exact measurements, the temperature coefficient of the apparatus must be taken into account. The standard condensers are enlarged and improved, whilst alterations in the compensation resistances are also described. With these improvements, it is possible to determine capacities five or ten times more accurately than with the older form of apparatus.

The dielectric constants of the following pure liquids have been very accurately determined: benzene, 2.288; *o*-nitrotoluene, 27.7; water, 81.1, all at 18°; these liquids may suitably be employed as standards. The dielectric constants of the following have been accurately determined, but either the liquids are more variable, or their purity has not been so thoroughly tested: ether, 4.368; aniline, 7.31; *m*-xylene, 2.376; nitrobenzene, 36.45, all at 18°. The dielectric constants of 16 other liquids and a number of temperature coefficients have also been determined.

J. C. P.

Influence of Non-electrolytes on the Conductivity of Electrolytes. By ARTHUR HANTZSCH (*Zeit. anorg. Chem.*, 1900, 25, 332—340).—The addition of carbamide, thiocarbamide, ethyl or methyl alcohol, ether, acetone, pyridine, urethane, or mannitol to aqueous solutions of the chlorides of the alkali or alkaline-earth metals diminishes the conductivity slightly, and to approximately the same extent. The addition of urethane or carbamide to solutions of silver nitrate produces a small diminution of conductivity, alcohol and mannitol have a rather larger effect, whilst thiocarbamide and pyridine have a very large effect. The addition of 2 mols. of pyridine to 1 of silver nitrate, for example, reduces the conductivity by more than 30 per cent.

The conductivity of ammoniacal solutions of ammonium chloride or calcium chloride is rather less than the sum of the conductivities of the solutions separately. The difference is somewhat greater in the case of ammoniacal solutions of silver nitrate. The latter contain the complex ion $\text{Ag}(\text{NH}_3)_2$, so that the mobility of this ion must be about the same as that of the simple ion Ag. The author considers that the results are best interpreted by Werner's theory (*Zeit. anorg. Chem.*, 1889, 3, 267).

T. E.

Decomposition-potentials of Fused and Solid Electrolytes. By CHARLES CORNFIELD GARRARD (*Zeit. anorg. Chem.*, 1900, 25, 273—312).—The salts are fused in hard glass tubes with electrodes of pure carbon. The currents produced by the application of a series of E.M.F.'s are observed and plotted in a curve. Each change of direction of this curve indicates the beginning of some decomposition. From the decomposition-potential (E) of a salt at the temperature T , and the temperature coefficient dE/dT , the heat of formation, Q , of the salt can be calculated by means of Helmholtz's equation, $Q = E - TdE/dT$. Where two decomposition points (E_1 and E_2) exist, two heats of formation may be calculated (Q_1 and Q_2). These are compared with the heat of formation determined by the calorimeter (Q).

The following table contains the principal numerical results:

Substance.	Temp.	E_1 volts.	$10 \frac{dE_1}{dT}$.	E_2 volts.	$10 \frac{dE}{dT}$.	Heat of formation.		
						Q_1 .	Q_2 .	Q .
NaI	650°	0·812						
KI	674	0·833						
PbI ₂	470	0·435	-7·7	0·723	-6·2	46500	55000	44900
PbCl ₂	669	0·80	-8·9	1·233	-8·0	75700	92200	75000
CdCl ₂	563	0·715		1·225				
CdBr ₂	591	0·62		0·91				
CdI ₂	468	0·515		0·681				
AgCl	536	0·760	-6·5			29800		28100
AgBr	566	0·469	-7·3			25000		25300
AgI	564	0·348	-6·5			20600		18300
AgI (solid)	465	0·5						
ZnCl ₂	467			1·505				
ZnBr ₂	504			1·21				

Lead Chloride and Iodide.—These salts are probably ionised as follows: $\text{PbI}_2 = \text{PbI} \cdot + \text{I}'$ and $\text{PbI} \cdot = \text{Pb} \cdot \cdot + \text{I}'$. The separation of the ions $\text{Pb} \cdot \cdot$ and I' from their charges will require one potential, that of the ions $\text{PbI} \cdot$ and I' another. Since PbI decomposes spontaneously into PbI_2 , and Pb when it is separated from its electric charge, it is obvious that this change is not reversible, and requires a higher potential than the reversible discharge of $\text{Pb} \cdot \cdot$ and I' ions. In accordance with this, the values of Q_1 agree well with those of Q for these salts. The first decomposition point is indistinct and not readily observed, whereas the second is well marked; it follows from this that the salts are mainly dissociated into $\text{PbI} \cdot$ or $\text{PbCl} \cdot$ ions. The results are quite similar to those obtained with water.

A saturated aqueous solution of lead chloride deposits Pb and PbO_2 at 1·568 – 0·002 t volts (with platinum point electrodes). A saturated aqueous solution of lead bromide gives Pb and Br at 1·306 volts (16°). The decomposition is the irreversible one through $\text{PbBr} \cdot$ ions.

With fused lead bromide, the results were untrustworthy owing to an increase of resistance at the anode; the curious behaviour of aqueous solutions of oxalic acid is shown to be due to a similar cause.

The saturated aqueous solution of cadmium chloride gives two decomposition points, showing that the electrolytic dissociation takes place in two stages.

Cuprous chloride, when fused, conducts the current in accordance with Ohm's law, and shows no polarisation.

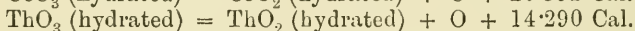
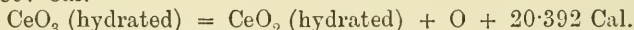
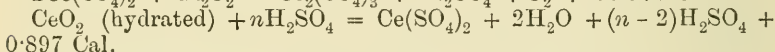
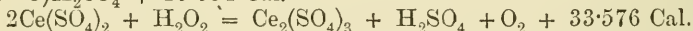
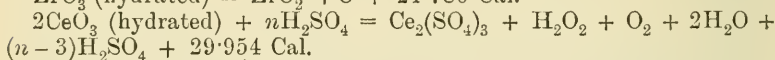
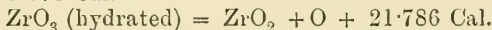
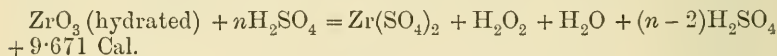
T. E.

Model to Show Ionic Migration. By W. LASH MILLER and FRANK B. KENRICK (*Zeit. physikal. Chem.*, 1900, 35, 440–442).—Two horizontal cords, carrying cardboard riders at fixed distances to represent the ions and stretched by weights at one end, are made to move in opposite directions and with different velocities by means of pulleys to which the other ends of the cords are attached; the diameters of the pulleys are in the ratio 1 : 2 : 3. This model shows how the ions are separated at the electrodes, and how the concentration of the inter-

mediate solution is affected by the migration of the ions. The potential difference between the electrodes may be represented by the driving pressure on the pulleys, so that the apparatus serves to illustrate Ohm's law (compare Müller, *Abstr.*, 1900, ii, 643; Kohlrausch, *Abstr.*, 1900, ii, 712). J. C. P.

Determination of the Specific Heat of Fats. By VANDEVYVER-GRAU (*Chem. Centr.*, 1900, ii, 923—924; from *Ann. Chim. anal. appl.*, 5, 321—323).—See this vol., ii, 46.

Thermochemistry of the Hyperacids of Zirconium, Cerium, and Thorium. By L. PISSARJEWSKY (*J. Russ. Phys. Chem. Soc.*, 1900, 32, 609—627. Compare *Abstr.*, 1900, ii, 466).—The following heats of reaction have been determined:



The heats of solution of hydrated thorium peroxide (Th_2O_7) and oxide in dilute nitric acid are 34·368 and 29·893 Cal. respectively.

By dissolving zirconium peroxide in excess of hydrogen peroxide solution in presence of an alkali hydroxide, the *sodium* (with $9\text{H}_2\text{O}$) and *potassium* (with $9\text{H}_2\text{O}$) salts of perzirconic acid, $\text{H}_4\text{Zr}_2\text{O}_{11}$, were prepared but could not be obtained in a pure state. T. H. P.

Vapour Pressures of Aqueous Alcoholic Salt Solutions. By M. S. WREWSKY (*J. Russ. Phys. Chem. Soc.*, 1900, 32, 593—609).—The vapour pressure of a solution of potassium carbonate in a mixture of methyl alcohol and water is found to increase with the proportion of salt present. If P is the vapour pressure of the aqueous alcohol and P_1 that of the aqueous alcoholic potassium carbonate solution, the value of $(P_1 - P)/P$ diminishes as the temperature rises. Experiments made with salts of the alkali and alkaline-earth metals show that the change produced in the value of the vapour pressure of aqueous methyl alcohol when equivalent quantities of salts of the same acid are dissolved in it, increases as the molecular weight of the base of the salt increases, whilst salts of the same base with different acids produce effects which decrease as the avidity of the acid increases. Further, the changes produced in the vapour pressure of such solutions at any temperature by replacing potassium chloride by sodium chloride or potassium carbonate by sodium carbonate are identical; a similar relation holds for the replacement of potassium carbonate by potassium chloride and of sodium carbonate by sodium chloride. The system methyl alcohol—water—potassium carbonate separates into two layers (one containing excess of water and the other excess of

alcohol) which are found to have equal vapour pressures, that of the water being lowered and that of the alcohol raised by the presence of the salt.
T. H. P.

Vapour Pressure of a Series of Benzene Compounds. By ADOLF WINKELMANN (*Zeit. physikal. Chem.*, 1900, 35, 480—482).—A criticism of certain statements made by Woringer (see Abstr., 1900, ii, 709).
J. C. P.

Vapour Pressures of Binary and Ternary Mixtures. By FRANS A. H. SCHREINEMAKERS (*Zeit. physikal. Chem.*, 1900, 35, 459—479).—The greater part of this paper, dealing with the system water—phenol, has already been abstracted (this vol., ii, 9). The author has further investigated the three-phase system: water—aniline. The vapour in contact with the two conjugate liquids, aniline—water and water—aniline, has at temperatures from 41—90° a composition intermediate between those of the liquids. At 56·3° and 75°, the vapour from aqueous solutions of aniline contains more aniline than the liquid. The experimental results for the system water—aniline are shown to agree with van der Waals' formula (*loc. cit.*). The composition of the vapour phase of the system water—phenol—aniline, the liquid and solid phases of which have been previously investigated (Abstr., 1899, ii, 739; 1900, ii, 135), has been determined at 56·3°, in contact with two conjugate liquid phases.
J. C. P.

Theory of Chemical Catalytic Action. By HANS EULER (*Ber.*, 1900, 33, 3202—3206. Compare Abstr., 1900, ii, 532).—The author holds that a catalytic agent affects the dissociation of the substances primarily concerned in a reaction, and applies this to the hydrolysis of ethyl acetate. When K is the equilibrium constant of the reaction, and k and k' the velocity constants of the two opposite component reactions, then $K = k/k'$. The catalytic agent has no effect on the ratio k/k' , but alters the absolute value both of k and k' in the proportion $1 : 1 + kH$, where H is the concentration of the hydrogen ions yielded by the catalytic agent. Since the ratio k/k' is unaltered by the catalytic agent, the free energy of the reaction ($= RT \log_e k/k'$) is also unaltered.
J. C. P.

Most General Form of the Laws of Chemical Kinetics for Homogeneous Systems. By RUDOLF WEGSCHEIDER (*Monatsh.*, 1900, 21, 693—786. Compare Abstr., 1900, ii, 199).—A theoretical paper, much of which is not suitable for abstraction. The author deduces general equations for the velocity of all kinds of reactions at constant volume in homogeneous systems. He discusses the form which the equation expressing the reaction must have, and the conditions which must be fulfilled in order (1) that the ratio of the velocities of two reactions which take place simultaneously is independent of the time; (2) that the concentration of a substance which is produced and decomposed in parallel reactions remains unchanged; (3) that the concentration changes of two substances are in a ratio to one another which is independent of the time. The form of the equation for reaction velocities with varying volume and (in the case of gases) with constant pressure is deduced, and the formulæ obtained are applied to

Bodenstein's experiments on the formation of water from hydrogen and oxygen (Abstr., 1899, ii, 733). J. C. P.

Sensitiveness to Light of Hydrogen Peroxide in Aqueous Solution on Addition of Ferro- and Ferri-cyanide. By WLADIMIR A. KISTIAKOWSKY (*Zeit. physikal. Chem.*, 1900, 35, 431—439).—When a few drops of potassium ferrocyanide are added to a 1 per cent. solution of hydrogen peroxide kept in the dark, the decomposition of the peroxide is very slow; if, however, the liquid is placed in direct sunlight, a brisk effervescence is observed in a few minutes, especially on shaking. It is shown that the liberation of oxygen from hydrogen peroxide under these conditions is in accordance with the equation: $k.t = \log a/(a-x)$, where k is a constant, a the initial concentration, and x the quantity of the hydrogen peroxide decomposed. The value of k when the reaction takes place in sunlight is 10—20 times greater than the value obtained when it takes place in the dark. It is not necessary that the liquid be illuminated the whole time; a minute's illumination is sufficient to accelerate the decomposition to the extent mentioned. It is shown that this acceleration is not due to a rise of temperature, but probably to a catalytic agent formed in the light from ferrocyanide and ferricyanide, an agent which is permanent even when illumination is discontinued.

J. C. P.

Absorption of Water Vapour by Chemical Compounds. By W. I. BUSNIKOFF (*J. Russ. Phys. Chem. Soc.*, 1900, 32, 551—593. Compare Abstr., 1899, ii, 360 and 409).—9.7340 grams of aqueous sulphuric acid of the composition $\text{H}_2\text{SO}_4 + 2.285\text{H}_2\text{O}$, and 42.9056 grams of acid corresponding with the hydrate $\text{H}_2\text{SO}_4 + 0.338\text{H}_2\text{O}$ were placed under the same desiccator and the concentrations of the two determined from time to time. At the end of 787 days the respective compositions were $\text{H}_2\text{SO}_4 + 0.877\text{H}_2\text{O}$ and $\text{H}_2\text{SO}_4 + 0.648\text{H}_2\text{O}$; so that if interchange of water between two masses of aqueous sulphuric acid takes place in such a manner that one of them forms a hydrate containing less than $1\text{H}_2\text{O}$, the other will also give a hydrate with less than $1\text{H}_2\text{O}$. Next two masses of 0.8054 and 51.0118 grams respectively of the same acid of the composition $\text{H}_2\text{SO}_4 + 0.285\text{H}_2\text{O}$ were placed under a bell jar in vessels of the same sectional area so that equal surfaces were exposed to the air; it was found that the weights of water absorbed in the two cases were almost identical, the rate of absorption being independent of the composition of the acid between the limits $\text{H}_2\text{SO}_4 + 0.285\text{H}_2\text{O}$ and $\text{H}_2\text{SO}_4 + 2.038\text{H}_2\text{O}$. It was previously shown (*loc. cit.*) that the hydrate $\text{H}_2\text{SO}_4 + 4\text{H}_2\text{O}$ possesses a greater power of absorbing water than the hydrates immediately weaker and stronger than it; further experiments show that in this hydrate the affinity with which the water is held also has a maximum value. On exposing approximately equal quantities of phosphoric oxide and the hydrate $\text{H}_2\text{SO}_4 + 0.887\text{H}_2\text{O}$ together under a desiccator, it is found that the former absorbs more water than the latter. Other experiments with aqueous sulphuric acids show that hydrates containing between 12 and 12.5 or between 18 and 19 mols. of water per H_2SO_4

have greater powers of absorbing water than the adjacent lower and higher hydrates.

The absorption of water vapour by sodium sulphate has also been studied, as well as the interchange of water between the hydrated salt and aqueous sulphuric acid, when placed under the same desiccator. In the latter case, 3.7280 grams of $\text{Na}_2\text{SO}_4 + 11.654\text{H}_2\text{O}$ and 1.1742 grams of $\text{H}_2\text{SO}_4 + 0.274\text{H}_2\text{O}$ were employed, the composition of the hydrated sodium sulphate being, after successive periods of 24 hours : $\text{Na}_2\text{SO}_4 +$ (1) $11.654\text{H}_2\text{O}$ (initial value), (2) $7.80\text{H}_2\text{O}$, (3) $5.704\text{H}_2\text{O}$, (4) $4.345\text{H}_2\text{O}$, &c. The affinities of these hydrates for water are (1) 0.047, (2), 0.074 and, (3) 0.110, and (4) 0.162 respectively, these numbers increasing in a geometrical progression with constant ratio about 1.50. In the same way, the sulphuric acid absorbs water, forming at the end of each 24 hours hydrates which have affinities for water increasing in geometrical progression with a constant ratio about 1.50.

In the case of anhydrous potassium carbonate, the affinities of the various hydrates for water increase geometrically with a ratio of about 1.40. Experiments were also made on the removal of water from aqueous potassium carbonate by means of sulphuric acid placed in the same desiccator.

Anhydrous sodium nitrate absorbs water vapour, yielding after successive intervals of 24 hours hydrates which have affinities for water nearly equal in value. When the water is removed from the hydrated nitrate by placing it together with sulphuric acid under a desiccator, the hydrates obtained at the end of each day's exposure have affinities for water of the values 0.077, 0.112, and 0.349 respectively, there being in this case no constant ratio. Similar experiments were made with potassium nitrate, the affinities of the various hydrates for water being 1.74, 1.48, 1.48, 1.72 and 1.76 respectively.

T. H. P.

Inorganic Chemistry.

Alleged Conversion of Phosphorus into Arsenic. By ANASTASIOS K. CHRISTOMANOS (*Chem. Zeit.*, 1900, 24, 943—944).—Arsenic trisulphide, prepared from commercial phosphorus by Fittica's method, was tested for phosphorus and nitrogen, but without success.

FRIEDRICH FITTICA replies that it is not surprising that the ordinary methods for the estimation of phosphorus and nitrogen should fail with arsenic, since the methods used for determining nitrogen in inorganic amino- or nitro-compounds are known to fail where the nitrogen is more firmly united, as in the case of many amino- and nitro-organic derivatives.

T. H. P.

Conversion of Phosphorus into Antimony. By FRIEDRICH FITTICA (*Chem. Zeit.*, 1900, 24, 991—992).—The exact conditions are given under which, according to the author, phosphorus is oxidised to

arsenic and antimony by means of ammonium nitrate and carbonate, and potassium nitrite. The composition PN_2O is assigned to arsenic and $\text{P}_2\text{N}_2\text{O}_2$ to antimony.

T. H. P.

Crystalline Form of Calcium, Barium, and Strontium Sulphides. By WILHELM MÜLLER (*Centr. Min.*, 1900, 178—179. Compare Abstr., 1898, ii, 376; 1899, ii, 97).—The material examined was prepared by E. Kunheim by heating in an electric furnace the sulphates of the alkaline earths with carbon: carbides are formed together with the sulphides. Cavities are lined with small cubes which are optically isotropic and have a perfect cubic cleavage. Sp. gr. (Kunheim): calcium sulphide, 2.4—2.5; strontium sulphide, 3.336. Mixed crystals of calcium and barium sulphide were also prepared. These sulphides are isomorphous with galena.

L. J. S.

Cadmium Selenide. By HENRI FONZES-DIACON (*Compt. rend.*, 1900, 131, 895—897).—When cadmium chloride is heated just to its volatilising point in a current of hydrogen selenide, cadmium selenide, CaSe , is obtained in pale brown, transparent crystals of sp. gr. 5.81 at 15° , which, like the zinc selenide obtained under similar conditions (Abstr., 1900, ii, 345), seem to belong to the hexagonal system. A chocolate-brown selenide of the same composition is obtained by the action of hydrogen selenide or alkali selenides on solutions of cadmium salts. The yellow compound obtained by Fabre by the action of sodium selenide on a solution of cadmium iodide, is a double salt of the composition $\text{CdI}_2 \cdot 3\text{CdSe}$, which is decomposed by the action of light in the presence of water. The chloride and bromide form similar but less stable compounds. Cadmium selenide, even when crystallised, is easily decomposed by acids, burns readily when heated in oxygen, and is decomposed by chlorine at a moderate temperature.

C. H. B.

Thallium Chlorobromides. By VICTOR THOMAS (*Compt. rend.*, 1900, 131, 892—895. Compare Meyer, Abstr., 1900, ii, 655; Cushman, *ibid.*, 725).—Thallium chlorobromide, $\text{Tl}_3\text{Cl}_2\text{Br}_4$, is obtained by the action of excess of bromine on thallous chloride, and forms small, transparent, sulphur-yellow prisms which seem to be rhombic. They alter somewhat when exposed to air at the ordinary temperature and are decomposed by water, especially on heating. Oxy-acids liberate a large quantity of halogens; bromine converts the salt into a compound or compounds of the type Tl_2X_6 , whilst when heated it yields salts of the type Tl_2X_3 .

The action of varying quantities of bromine on thallous chloride also yields compounds of the types Tl_2X_3 and Tl_2X_6 , and these will be described subsequently.

C. H. B.

Combination of Nitrogen with Metals of the Rare Earth Group. By CAMILLE MATIGNON (*Compt. rend.*, 1900, 131, 837—839. Compare Abstr., 1896, ii, 299; 1900, ii, 726).—Winkler has shown that metallic magnesium liberates the metal from the oxides of thorium, cerium, and lanthanum, and this is now found to be true for the oxides of praseodymium, neodymium and samarium. A mixture of the oxide of the metal and metallic magnesium was strongly heated in an

atmosphere of the gas to be investigated; it was found that nitrogen, but not argon, is rapidly absorbed by thorium, cerium, lanthanum, praseodymium, neodymium, and samarium.

The heat of formation of the oxides of thorium and cerium is greater than that of the oxides of the other metals, the oxide of samarium being the least exothermic.

H. R. LE S.

Direct Combination of Hydrogen with the Metals of the Rare Earths. By CAMILLE MATIGNON (*Compt. rend.*, 1900, 131, 891—892).—Neodymium, praseodymium, and samarium combine directly with hydrogen when the metals are liberated in the presence of this gas by the action of magnesium on the corresponding oxides. The hydrides thus formed are dissociated when strongly heated.

C. H. B.

Samarium Carbide. By HENRI MOISSAN (*Compt. rend.*, 1900, 131, 924—926).—*Samarium carbide*, SmC_2 , obtained by heating a compressed mixture of samarium oxide, Sm_2O_3 , with sugar carbon in the electric furnace, has a more metallic appearance than neodymium and praseodymium carbides (Abstr., 1900, ii, 726), but small particles are shown by the microscope to consist of transparent, yellow, hexagonal crystals; it has a sp. gr. 5.86. It is not reduced by hydrogen at 1000° , but is decomposed by chlorine when gently heated, and by bromine or iodine at a dull red heat. In oxygen at 400° , the carbide undergoes complete combustion, and it is also attacked by sulphur at a much higher temperature. In its action on water, samarium carbide resembles yttrium carbide, the gaseous products consisting of acetylene (71 per cent.), olefines (8 per cent.), and hydrogen and paraffins (21 per cent.). The carbide is readily decomposed by acids, and by hydrogen sulphide or hydrogen chloride at a red heat.

N. L.

Abrasive Efficiency of Corundum. By WILLIAM H. EMERSON (*Trans. Amer. Inst. Mining Engineers*, 1900, 29, 230—248).—Numerous comparative tests were made of the abrasive power of different samples of corundum from Georgia and North Carolina, and partial chemical analyses were made of the same material. There appears to be no close connection between abrasive power and chemical composition.

L. J. S.

Presence of Ferrous Oxythiocarbonate in the Water of the Rhone. By HENRI CAUSSE (*Compt. rend.*, 1900, 131, 947—949).—At certain periods during the last four years, it has been noticed that the water of the Rhone restores the colour of Schiff's reagent and exhibits other reactions characteristic of aldehydes. The reactions are first observed in June or July, reach a maximum in September, and disappear later in the year; they are not given by the water after distillation, or after exposure to air, which causes the formation of an ochreous deposit. Synthetic experiments show that the substance to which the reactions are due is probably ferrous oxythiocarbonate, $\text{CO} \begin{smallmatrix} \text{S} \\ \diagup \quad \diagdown \\ \text{O} \end{smallmatrix} \text{Fe}$, formed by the combination of carbon dioxide with ferrous sulphide, the latter being the result of the reduction of sulphates by organic matter.

N. L.

Action of Steam and of Mixtures of Steam and Hydrogen on Molybdenum and its Oxides. By MARCEL GUICHARD (*Compt. rend.*, 1900, 131, 998—1001).—The brown molybdenum dioxide, MoO_2 , resulting from the action of hydrogen on the trioxide at 470° , is completely reduced by a current of the gas at 600° ; on the other hand, finely divided molybdenum is not oxidised by steam at temperatures below 700° . From these observations, it follows that the steam produced by the action of hydrogen on the oxides of molybdenum at 600 – 700° has no tendency to reverse the action, and may be considered as an inert gas; above 700° , however, it is a reagent and the inverse change becomes possible. When molybdenum and its dioxide are heated at these temperatures in a mixture of hydrogen and steam, both reactions, oxidation and reduction, occur simultaneously, and the state of equilibrium finally attained depends on the partial pressures of the constituents of the gaseous mixture. The metal or its dioxide is not affected at 800° by a current of the gaseous mixture containing its constituents in approximately molecular proportion; when the proportion of steam is larger than this, the metal is almost wholly oxidised to dioxide, whilst excess of hydrogen brings about a complete reduction of the oxide. G. T. M.

Bismuth Phosphates. By CLEMENTE MONTEMARTINI and U. EGIDI (*Gazzetta*, 1900, 30, ii, 377—381).—The only phosphate obtainable from bismuth solutions by precipitation and subsequent washing is the ortho-phosphate, BiPO_4 , which is stable towards water even after boiling for some time, and is almost insoluble in sodium pyrophosphate solution. T. H. P.

General Method of Separating the Metals that accompany Platinum. By ÉMILIE LEIDIE (*Compt. rend.*, 1900, 131, 888—891).—The residues from the manufacture of platinum and iridium are roasted in the air, heated in hydrogen, washed with dilute hydrochloric acid, again heated in hydrogen, and then mixed with sodium chloride and heated in chlorine at an incipient red heat. The residue and the volatilised products are treated with water, and the solution allowed to remain until the silver and the greater part of the lead and bismuth have separated as chlorides. The solution is heated at 100° and mixed gradually with excess of sodium nitrite, which precipitates the iron and gold, and afterwards with sodium carbonate, which precipitates lead, copper, bismuth, &c. After boiling for some time, the liquid is filtered, mixed with sodium hydroxide and distilled in a current of chlorine. The osmium and ruthenium are thus volatilised, and can be separated in the ordinary way. The residual liquid is acidified with hydrochloric acid, again mixed with excess of sodium nitrite, and a large quantity of ammonium chloride added, when the iridium and rhodium are precipitated as double ammonium nitrites. The precipitate is dissolved in hot hydrochloric acid, evaporated to dryness, dissolved in water and mixed with excess of ammonium chloride, which precipitates iridium, but not rhodium. The precipitate is dried and heated at 450° with its own weight of sodium chloride, which converts the iridium into soluble sodium iridochloride, and any co-precipitated rhodium into the insoluble anhydrous chloride.

The rhodium ammonium chloride is separated by crystallisation, dissolved in water, and converted first into the double sodium nitrite and afterwards into the double ammonium nitrite, which is precipitated, whilst any traces of iridium that may be present remain in solution.

The mother liquor from the iridium and rhodium contains platinum and palladium, and is evaporated to dryness, heated with concentrated hydrochloric acid to decompose the nitrites, again evaporated to dryness, and strongly heated. The residue is washed with water, dissolved in aqua regia, evaporated, redissolved and a current of nitric oxide passed into the liquid in order to reduce the palladium and iridium chlorides, after which the liquid is saturated with ammonium chloride to precipitate the platinum. The palladium in the mother liquor is precipitated by adding mercuric cyanide. C. H. B.

Mineralogical Chemistry.

Contributions to Chemistry and Mineralogy. By FRANK W. CLARKE (*Bull. U.S. Geol. Survey*, 1900, No. 167, 166 pp.).—This gives a collection of recently published researches which have been carried out in the laboratory of the United States Geological Survey by F. W. Clarke, W. F. Hillebrand, H. N. Stokes, G. Steiger, and N. H. Darton. L. J. S.

Simultaneous Production of Two Nitrogen Compounds in the Crater of Vesuvius. By RAFF. VITT. MATTEUCCI (*Compt. rend.*, 1900, 131, 963—965).—The simultaneous ejection, during the recent eruption of Vesuvius, of fragments of rock coated, on the one hand, with ammonium chloride and, on the other, with iron nitride points to the existence of a genetic relation between these two substances. This view is in accordance with Silvestri's experiments.

ARMAND GAUTIER states that he has already referred to iron nitride as one of the sources of ammonium salts in volcanic lavas (this vol., ii, 14). N. L.

Separation of Titaniferous Iron-Ores in Basic Igneous Rocks. By JOHAN H. L. VOGT (*Chem. Centr.*, 1900, ii, 818—819; from *Zeit. prakt. Geol.*, 1900, 233—242).—Previous papers by the author have treated in detail the concentration (magmatic differentiation) of ores of iron, nickel, &c., in igneous magmas. A description is now given of two types of separation, namely, of titaniferous iron-ore and of magnesium silicate, from the same magma at Lofoten in northern Norway. Analysis of spinel (pleonaste) from a basic separation at Solnör, Norway, gave :

Al ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	MnO.	MgO.	Total.
61·8	4·6	18·1	1·05	14·75	100·3.

L. J. S.

Chromite from North Carolina. By JOSEPH HYDE PRATT (*Trans. Amer. Inst. Mining Engineers*, 1900, 29, 17—39).—This covers the same ground as a previous paper (Abstr., 1899, ii, 494). The following additional analysis by C. Baskerville is given of chromite from Burnsville, Yancey Co.:

Cr_2O_3 .	Al_2O_3 .	FeO .	MgO .	SiO_2 .	CaO .
58.00	15.52	14.45	8.26	3.20	0.70.

L. J. S.

Blödite from Hallstatt. By RUDOLF KOECHLIN (*Ann. naturhist. Hofmus. Wien*, 1900, 15, 103—110).—A crystallographic description is given of a new find of blödite ("simonyite") from Hallstatt. Some of the crystals have a dull, weathered surface, but those in freshly-opened cavities are bright. As "simonyite" from Hallstatt was supposed to differ from blödite in not efflorescing in the air, the following analysis by Ernst Brezina has been made of the dull crystals:

SO_3 .	MgO .	Na_2O .	H_2O .	Total.
47.45	12.16	19.79	20.99	100.39

This gives the blödite formula, $\text{MgSO}_4\text{Na}_2\text{SO}_4\cdot 4\text{H}_2\text{O}$. At 108° , there is a loss of 8.51 per cent., and at 200° all the water is expelled. Associated with the blödite are polyhalite, anhydrite, salt, gypsum, and glauberite. A crystallographic description is given of the glauberite.

L. J. S.

Ceruleite, a New Mineral. By HENRI DUFET (*Bull. Soc. franç. Min.*, 1900, 23, 147—150).—This occurs as turquoise-blue, clay-like masses in the Emma Luisa Mine at Huanaco, Taltal, Chili. Sp. gr., 2.803. Under the microscope, it is seen to be minutely crystalline. Analysis I gives the formula $\text{CuO}\cdot 2\text{Al}_2\text{O}_3\cdot \text{As}_2\text{O}_5\cdot 8\text{H}_2\text{O}$. At 180° , there is a loss of only 1.45 per cent.

	As_2O_5 .	Al_2O_3 .	CuO .	H_2O .	SiO_2 .	Total.
I.	34.56	31.26	11.80	22.32	—	99.94
II.	1.8	38.8	trace	19.1	40.6	100.3

Associated with the ceruleite is a white clay resembling halloysite, which on analysis gave the results under II. Both minerals contain minute scales of gold, 1 per cent. of which has been deducted from analysis II.

L. J. S.

Cordierite from Celebes and Germany. By HUGO BÜCKING (*Ber. Senckenb. Ges. Frankfurt. a. M.*, 1900, 20 pp.).—Among the ejected blocks of andesite from the volcano Seputan in north Celebes are a few shining black fragments which resemble obsidian in appearance. Thin sections under the microscope, however, show that this material consists almost wholly of minute fresh crystals of cordierite, with very little glass, iron-ore (about 4 per cent.) and either augite or sillimanite. The following bulk analysis by W. Bruhns of the material shows that, although the results are in approximate agreement with the formula of cordierite, most of the magnesium of normal cordierite is replaced by calcium and iron.

SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	CaO.	MgO.	Loss on ignition.	Total.	Sp. gr.
49·15	31·84	2·88	11·49	4·30	0·55	0·06	100·27	2·65

A description is also given of the cordierite which occurs in the altered ("vitrified") sandstones in contact with basalt in central Germany.

L. J. S.

Crystallographic Constants and Chemical Composition of Tourmaline. By ERNST ANTON WÜLFING (*Programm z. 82 Jahresfeier d. k. Württemb. landwirt. Akad. Hohenheim*, 1900, 99 pp. Compare Abstr., 1889, 765; 1900, ii, 602).—Previously published constants are discussed, and numerous new crystallographic, optical and density determinations are given of material which was, whenever possible, the same as that analysed by previous authors. For crystals from various localities the angle γ varies from $46^{\circ}48'$ to $47^{\circ}15'$, the corresponding values of the c axis being 0·4469 and 0·4521 respectively. The refractive indices and double refraction also vary considerably: $\epsilon = 1·6159$ to $1·6572$; $\omega = 1·6354$ to $1·6918$ (for line E). Sp. gr. 3·007 to 3·240. The double refraction and the sp. gr. both increase with the amount of iron. Four groups of tourmaline may be distinguished, namely, those rich in lithium, ferrous iron, ferric iron or magnesium; the iron tourmalines are black, but those of the second group have pale reddish-violet and blue as axial pleochroism colours, whilst those of the third group have brownish and dark green. The variations in the chemical composition of tourmaline are well illustrated by a coloured plate giving graphically the results of 33 of the best analyses.

L. J. S.

New Mineral Occurrences [Inesite]. By OLIVER CUMMINGS FARRINGTON (*Field Columbian Museum, Chicago, Geol. Series*, 1900, 1, 221—231).—The rare mineral inesite has been found at San Cayetano mine, near Villa Corona, State of Durango, Mexico, where it occurs as radiating tufts of flesh-red crystals. Measurements and figures are given of the crystals, and an analysis gave the results under I. At 110° there is a loss of 3·88 and at 240° of 1·94 per cent., the rest of the water being given off at a red heat; the formula is therefore written as $H_2(Mn, Ca, Fe)_6Si_6O_{19} + 3H_2O$.

	SiO ₂ .	MnO.	FeO.	CaO.	MgO.	H ₂ O.	Total.	Sp. gr.
I.	44·89	36·53	2·48	8·24	trace	8·20	100·34	2·965
II.			1·18	28·27	22·46			2·878

A compact white dolomite from near Lakeport, Lake Co., California, gave the results under II; it is used by the Indians as money. Crystallographic descriptions are also given of caledonite, gaylussite, epsomite and calcite from new localities in the United States.

L. J. S.

Granite Rocks of Butte, Montana [Analyses of Biotite and Hornblende]. By WALTER HARVEY WEED (*J. Geol.*, 1899, 7, 737—750).—In a petrographical paper on the granite and associated rocks in the neighbourhood of Butte, the following mineral analyses,

by H. N. Stokes, are given : I, black biotite ; II,* very dark-green hornblende, with a large angle of optical extinction ; both minerals were isolated from the Butte granite, of which the average composition is given under III :

	SiO ₂ .	TiO ₂ .	P ₂ O ₅ .	F.	Cl.	Al ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	MnO.	BaO.
I.	35.79	3.51	0.10	0.76	0.20	13.70	5.22	13.72	0.19	0.13
II.	45.73	1.43	0.35	0.23	—	6.77	4.94	10.39	0.54	nil
[III.	64.03	0.60	0.18	—	—	15.58	1.96	2.83	0.11	0.07

	SrO.	CaO.	MgO.	K ₂ O.	Na ₂ O.	Li ₂ O.	H ₂ O below 110°.	H ₂ O above 110°.	Total, less O for F. & Cl.
I.	nil	0.05	12.13	9.09	0.15	trace	1.21	3.64	99.22
II.	nil	11.25	12.32	1.22	0.77	trace	0.49	2.29	98.65
III.	0.04	4.20	2.15	4.11	2.76	—	0.20	0.73	99.87

L. J. S.

Analyses of Rocks. By FRANK W. CLARKE (*Bull. U.S. Geol. Survey*, 1900, No. 168, 308 pp.).—This is a new and enlarged edition of the second portion of *Bulletin* No. 148 (1897). It gives a collection of 1404 detailed analyses of rocks (including igneous and crystalline rocks, sandstones, carbonate-rocks, slates and shales, clays, soils, &c.) and meteorites, and of minerals isolated from them, which have been made during the years 1880—1899 in the laboratory of the United States Geological Survey.

L. J. S.

Meteorite from Lançon, France. By STANISLAS MEUNIER, (*Compt. rend.*, 1900, 131, 969—972).—This stone was seen to fall on June 20, 1897, at Lançon, Dept. Bouches-du-Rhône. Besides the usual black crust, there are internal black surfaces which are seen on fractures as fine "cosmic lines." From a partial mechanical and chemical analysis, the mineralogical composition is deduced as : nickel-iron 8.80 ; pyrrhotite, 6.35 ; chromite, 0.54 ; enstatite, and plagioclase, 52.21 ; olivine, [32.10] = 100.00. Sp. gr. 3.482. The nickel-iron contains 8.21 per cent. of nickel. Thin sections under the microscope show an intimate mixture of crystalline fragments.

L. J. S.

Water from the Kiedrich Spring near Eltville, Rhine. By HEINRICH FRESENIUS (*Jahrb. Nassau. Ver. Naturk.*, 1900, 53, 1—21).—Water from this saline spring in the Kiedrichthal issues at a temperature of 24.3°, and has sp. gr. 1.006630 at 17.5°. It has a salty taste and is clear and colourless, but becomes cloudy on standing. The analytical results are compared with an analysis of the same water made by C. Bischoff in 1888, and with analyses of waters from several other salt springs.

L. J. S.

* In anal. II are inserted corrections made by the author ; compare *Bull. U. S. Geol. Survey*, 1900, No. 168, 116.

Physiological Chemistry.

Peptic Digestion. By HANS MALFATTI (*Zeit. physiol. Chem.*, 1900, 31, 43—48).—The prolonged action of pepsin-hydrochloric acid on Witte's peptone leads to the formation of tryptophan. Leucine, tyrosine, and hexon bases were found in small quantities in some cases. These products are generally regarded as characteristic of tryptic digestion, and the question is discussed whether they are produced by the activity of pepsin itself, or of another ferment which contaminates the pepsin. The former explanation is regarded as more probable, although it is weakened by the discovery that all preparations of pepsin, some of which may be intensely active, do not cause the appearance of the products named. Attempts to separate a second ferment failed.

W. D. H.

The Rennet and Anti-Rennet-like Action of Blood. By E. FULD and KARL SPIRO (*Zeit. physiol. Chem.*, 1900, 31, 132—155).—The rennet-like action of blood is not due to serum-albumin, but to that portion of the globulin which is precipitable by dialysis (euglobulin); the anti-rennet action is associated with the portion of the serum-globulin which is not precipitable by dialysis (pseudo-globulin); this action is probably associated with its affinity for calcium.

W. D. H.

Cryoscopy of the Human Sweat. By P. ARDIN-DELTEIL (*Compt. rend.*, 1900, 131, 844—845).—From determinations of the freezing point of 14 samples of healthy human sweat, the following conclusions are drawn: (1), the mean freezing point is -0.237° ; (2), this varies with different individuals between -0.08° and -0.46° ; (3), the variations depend, for the greater part, on the amount of sodium chloride in the sweat. The lowest values observed were obtained during the summer.

H. R. LE S.

Creatinine. By ADALBERT GREGOR (*Zeit. physiol. Chem.*, 1900, 31, 98—118).—Experiments were made on the reducing power of creatinine; the numbers obtained closely approximate to those of G. S. Johnson. Salkowski's method is regarded as the most accurate for quantitative purposes. Beer drinking was found to increase the reducing properties of urine, but this is not due to variations in creatinine. Muscular exercise produces a marked increase in the urinary creatinine, and creatinine is regarded as a specific product of muscular metabolism.

W. D. H.

Diuretic Action of Isotonic Salt Solutions. By R. MAGNUS (*Chem. Centr.*, ii, 1900, 1031; from *Arch. exp. Path. Pharm.*, 44, 396—433).—Isotonic solutions of sodium chloride and sodium sulphate produce equal dilution of the blood, but the latter is a more powerful diuretic, because of its direct action on the kidneys. Three kinds of diuresis are described: (1), water diuresis dependent on increase of water in the blood; (2), salt diuresis, as in that produced by Glauber's

salts ; and (3), combined salt and water diuresis in which both factors are concerned. W. D. H.

Pathology of Diabetic Coma. By KARL GRUBE (*Chem. Centr.*, ii, 1900, 1030—1031 ; from *Arch. exp. Path. Pharm.*, 44, 349—362).—Sternberg states (*Zeit. klin. Med.*, 38, 65) that β -aminobutyric acid is the toxic material in diabetic coma, this passing into the urine as β -hydroxybutyric acid. Injection of the amino-acid in cats produces coma ; the urine gives Fehling's, Gerhard's, and Lieben's reactions, and contains acetone. W. D. H.

Metabolism in Gout. By CHALMERS WATSON (*J. Pathol. and Bacteriol.*, 1900, 7, 103—117).—A large number of observations are recorded, both as regards the blood, uric acid, and the influence of nucleic acid. The results suggest that in gout the formation of uric acid from the metabolism of the absorbed nucleins and its excretion are altered in no important way from the normal state. The primary changes in gout must probably be looked for in general intracellular metabolism. W. D. H.

The Activity of Saliva in various Diseased Conditions. By W. G. AITCHISON ROBERTSON (*J. Pathol. and Bacteriol.*, 1900, 7, 118—128).—Attention is directed to the importance of examining the amount and activity of the saliva in disease. Numerous observations are recorded here both in children and adults. The practical importance of the question is seen in dieting ; starchy foods should naturally be withheld, or if given should be previously diastased, in cases where the secretion is scanty or in abeyance, as in fever, and the acute infectious diseases ; in dilatation of the stomach, the saliva contains almost no ptyalin ; morphine and atropine inhibit the secretion. W. D. H.

An Albumose in Urine. By J. A. MILROY (*J. Pathol. and Bacteriol.*, 1900, 7, 95—102).—An account is given of the properties of an albumose occurring in the urine of a patient who probably suffered from bone disease. The characters of the albumose do not agree fully with those of any substance previously described, although they approach nearest to those of deutero-albumose. W. D. H.

Interesting Abnormal Urines. By RUDOLF KOBERT (*Chem. Centr.*, 1900, ii, 919—920 ; from *S. Korresp. Bl. Allgem. Mecklenburg. Aerzte-Ver.*, 1900, No. 212).—Cases of cystinuria, indicanuria and diaceturia are described. These are somewhat rare conditions, but nothing new appears to have been made out. W. D. H.

Poisonous Effects of Saline Solutions. By ANNE MOORE (*Amer. J. Physiol.*, 1900, 4, 386—396).—The facts described by Loeb regarding the poisonous effects of pure sodium chloride solutions on marine organisms are also true for fresh-water animals (young trout and tadpoles). The chlorides of calcium, potassium, magnesium, and lithium are also poisonous. The poisonous effects of sodium chloride may be antagonised by calcium. W. D. H.

A Volatile Venom from the Skin of *Iulus Terrestris*. By C. PHISALIX (*Compt. rend.*, 1900, 131, 955—957).—The cutaneous secretion of the myriapod *Iulus terrestris* has a yellow colour, and when injected intraperitoneally in guinea pigs proves fatal. The autopsy shows extensive peritonitis. The active material in this venom is not proteid but some volatile substance. W. D. H.

Quinone as the Active Principle of the Venom of *Iulus Terrestris*. By AUGUSTE BÉHAL and C. PHISALIX (*Compt. rend.*, 1900, 131, 1004—1007).—The aqueous solution of the venom of *Iulus terrestris* has a yellow colour and contains a quinonoid substance which, in all probability, is benzoquinone. G. T. M.

Chemistry of Vegetable Physiology and Agriculture.

A Possible Cause of Clumping in Bacilli. By SIR THOMAS LAUDER BRUNTON (*J. Pathol. and Bacteriol.*, 1900, 7, 53—54).—Wooden matches covered with hard soap to imitate bacteria remain separate in neutral or alkaline water, but if the water is acidified they clump together. The same is true for the formation of rouleaux in cork models of red blood corpuscles. It is suggested that the formation of clumps and rouleaux respectively is due to some slight alteration of their surfaces produced by the liberation of some fatty substance by means of carbon dioxide. W. D. H.

A Proteolytic and Rennet-like Ferment in Malt. By FR. WEIS (*Zeit. physiol. Chem.*, 1900, 31, 79—97).—In the green and dry malt, there is present both a proteolytic (peptase) ferment and one which curdles milk. Most attention is directed to the latter; this acts best in an acid (especially lactic acid) medium, and plays an important part, not only in the germinating process in the plant, but also in the making of beer. W. D. H.

Presence of Seminase in Non-germinating Seeds containing Horny Albumen. By ÉMILE BOURQUELOT and HENRI HÉRISSEY (*Compt. rend.*, 1900, 131, 903—905).—The non-germinating seeds of *Medicago sativa* and *Indigofera tinctoria* contain a small quantity of seminase which can be extracted from the finely ground seeds by treatment with water. Like the seminase produced during germination (*Abstr.*, 1900, ii, 233), it converts the horny albumen of the seeds into assimilable sugars. C. H. B.

Exosmosis of Diastase by young Seedlings. By JULES LAURENT (*Compt. rend.*, 1900, 131, 848—851).—The germinating seeds of maize, wheat, peas, and buckwheat are able to furnish a part of the diastase necessary for the digestion of their reserve food material, and are thus able to assimilate insoluble organic substances such as starch. This phenomenon ceases at the end of the germinating period. Experiments carried out by a method previously described (*Compt. rend.*,

1897, 125, 887) clearly show that the roots are incapable of exuding any appreciable quantity of amylase.

H. R. LE S.

Assimilation in two Cultivated Plants. By ALEXIUS VON SIGMOND (*Chem. Centr.*, 1900, ii, 1087; from *J. Landw.*, 48, 251—264).—Maize plants develop slowly during the first period of growth, but more quickly from this time to the flowering period. Growth is then checked for a time, but afterwards quickens. During the deposition of starch, the growth is again checked, after which, during the ripening of the grain, assimilation becomes very vigorous. On the whole, assimilation and development go together, and no special manure seems to be necessary.

In the case of tobacco, development was slow in the early stages of growth, and increased and diminished alternately during the subsequent periods. There seems to be a slight temporary want of phosphoric acid in the first period, and also of nitrogen; the importance of nitrogen increases before the beginning of the first period of greater activity. These results accord with what has been observed in practice.

N. H. J. M.

Angostura Barks. By C. HARTWICH and M. GAMPER (*Arch. Pharm.*, 1900, 238, 568—587).—The interest of the paper is chiefly pharmaceutical, and that in the botanical direction. The bark of *Esenbeckia febrifuga* (*syn. Evodia febrifuga*), sold under the name of angostura bark, was examined chemically; from it, 0.11 per cent. of a solid "ethereal oil" melting at 37—42° was obtained by distillation with steam; and by percolation with 1 per cent. aqueous tartaric acid, 3.9 per cent. of alkaloids was obtained. From this mixture, five alkaloids were separated by taking advantage of the differences in the ease with which they are liberated by ammonia and by sodium hydroxide, and by the differences in their solubility in ether, chloroform, and absolute alcohol.

C. F. B.

Hibiscus Esculentus. By ALEXANDER ZEGA (*Chem. Zeit.*, 1900, 24, 871).—The green fruit of *Hibiscus esculentus*, which is sold in Servia as a vegetable under the name of 'Bamuje,' has the following mean percentage composition: water, 80.74; nitrogenous material, 4.15; fat, 0.42; carbohydrates, 12.12; wood fibre, 1.15; ash, 1.41, the percentages of nitrogenous material and carbohydrates on the dry material being 21.55 and 63.24 respectively. The ash contains SiO_2 , 0.06; SO_3 , 0.034; phosphoric acid, 0.043; CaO , 0.100; MgO , 0.016; K_2O , 0.042; Na_2O , 0.058 per cent. of the original substance.

T. H. P.

"Radix Naregamiae." By RUDOLPH HAUKE (*Chem. Centr.*, 1900 ii, 1129—1130; from *Zeit. Oesterr. Apoth.-Verein.*, 38, 829—833).—An ethereal extract of "*Radix Naregamiae*" contained 0.3 per cent. of Hooper's alkaloid naregamine, 2.0 of wax, 2.5 of resin, and 0.9 of fatty oil and colouring matter. The wax melted at 58°, had a sp. gr. 0.91, acid number 5.9 (chloroform solution), 6.1 (alcoholic solution), ether number 21.1, and saponification number 27.0. When the alcoholic solution was poured into water, a resin was precipitated, whilst in the solution there still remained a substance which readily

reduced Fehling's solution (sugar). The aqueous extract had a faint acid reaction and gave a blue coloration with iodine; a crystalline compound, which is probably asparagine (Hooper), was also isolated and the extract contained proteids, gum, and pectin substances but not tannin. The drug left 5.73—7.1 per cent. of ash, that of the wood being 1.79 and that of the bark 5.97; 5.9 per cent. of dry residue was obtained from the alcoholic and 12.3 from the aqueous extract.

E. W. W.

Simarubaceæ I. Samadera Indic. By J. L. B. VAN DER MARCK (*Chem. Centr.*, 1900, ii, 1124—1125; from *Ned. Tijds. Pharm.*, 12, 296—306).—The seeds of *Samadera Indic.* contain 63 per cent. of fat, which consists of 87.7 per cent. of triolein, 8.41 of tripalmitin, and 3.89 of tristearin. The alcoholic extract contains an alkaloid which appears to be identical with gliadine and a resin; glucosides and a bitter principle are present in the seeds. The bitter principle is also contained in the bast and is accompanied by tannic acid; it is somewhat soluble in alcohol and acetone, melts at 255°, and is apparently identical with Rost van Tonningen's samaderin. It contains carboxyl groups but neither a methoxy- nor an ethoxy-group, and when administered to cold blooded animals causes paralysis of the voluntary nerves and death.

A second bitter principle is found in the roots; it melts at 209°, is soluble in alcohol and sodium hydroxide solution, and is apparently identical with quassin.

E. W. W.

[Feeding Experiments with Cows.] By EBERHARD RAMM (*Bied. Centr.*, 1900, 29, 737; from *Milch-Zeit.*, 1899, 52, 817. Compare *Abstr.*, 1900, ii, 749).—A summary of the results of experiments already described. Besides the actual results, corrected results are given, excluding the effects of period of lactation, on the assumption that the same food produces the same effect. The conclusion is drawn that when rich foods are employed, it is undesirable to go beyond a certain limit as regards the amounts of proteid and fat in the rations. Certain foods exert a specific action which does not depend on the amounts of nutritive substances they contain.

N. H. J. M.

Value of Molasses-Foods. By MAX GONNERMANN (*Chem. Centr.*, 1900, ii, 1034; from *Milch-Zeit.*, 29, 599).—Oil seeds mixed with molasses may undergo considerable loss when long kept, and mixtures of brewer's grains with molasses, if not quite dry, may decompose rapidly, owing to the presence of yeasts and bacteria. Under these conditions, all the sugar and nitrogenous substances may be lost, and injurious compounds may be produced. The employment of peat-meal molasses is strongly recommended; it may be mixed with oil-seeds as required.

N. H. J. M.

Nutritive Value of Orange Residues in Calabria. By FAUSTO GABRIELLI (*Bied. Centr.*, 1900, 29, 780; from *Staz. sper. agrar. ital.*, 1899, 32, 204).—The residues of oranges, &c., in Calabria are utilised as cattle food, especially after being allowed to decompose until they acquire a uniform buttery consistence. The following are the results of analyses of (1) lemon, (2) Bergamot orange, residues, and (3) the mixed

residues, fermented; water in fresh substance (1) 89.10, (2) 88.53, (3) 92.91 per cent. Percentage composition of the dry matter:

	Total N.	Proteid N.	Fat.	Non- nitrogenous extract.	Crude fibre.	Ash.	K ₂ O.	P ₂ O ₅ .
1.	0.60	0.36	0.97	80.39	12.03	4.34	0.53	0.36
2.	0.65	0.44	1.09	82.21	9.20	4.75	—	0.29
3.	1.38	0.78	5.51	61.33	21.80	6.52	1.36	0.38

Milk and meat from animals fed with the residues have a characteristic, but not unpleasant, taste. N. H. J. M.

Relation between the Weight and the Percentage of Nitrogen in Wheat Grain. By WILHELM JOHANNSEN and FR. WEIS (*Bied. Centr.*, 1900, 29, 758—760; from *Tidsskr. Landw. Planteavl.*, 1899, 5, 91—99).—The results of analyses of large, average, and small grains of different varieties of wheat show that, as in the case of barley (Abstr., 1900. ii, 363), a relation exists between the weight and the percentage of nitrogen, which is highest in the large grains. There are, however, many exceptions, and the rule cannot be adopted for improving varieties of wheat and barley. The large, mealy grains, which were always heavier than the average of the whole, invariably contained less nitrogen than the whole sample. N. H. J. M.

Manurial Experiments with Hops. By MAX BARTH (*Bied. Centr.*, 1900, 29, 728—731; from *Bl. Gersten-, Hopfen-, u. Kartoffelbau.*, 1899, 323).—The results of field experiments showed that hops require mineral manures as well as nitrogen even on fertile soils. N. H. J. M.

Green Manure Experiments with Potatoes. By CLAUSEN (*Bied. Centr.*, 1900, 29, 733—735; from *Illust. Landw. Zeit.*, 1900, 129).—The average yield of potatoes, with various manures, after lupins as green manure, was 135, taking the yield of the potatoes without green manure as 100. The results of experiments with different varieties of potatoes showed that those varieties with the longer vegetative periods seem to benefit less than those with short vegetative periods.

Both kainite and superphosphate, with green manure, further increased the yield of potatoes. N. H. J. M.

Effect of Water and Manure on the Composition of Potato Ash. By A. VON DASZEWSKI (*Chem. Centr.*, 1900, ii, 1086—1087; from *Inaug.-Diss. Göttingen*, 1900).—An extension of the work commenced by Wilms (Abstr., 1900, 164). With excessive moisture, the assimilation of potassium and phosphoric acid is absolutely greater and relatively less than with less moisture, whilst relatively greater amounts of calcium and chlorine are taken up.

The application of a substance as manure causes an increased amount of the substance to be taken up by the plant, especially by the leaves. Calcium and chlorine have the predominating action in decreasing the starch in presence of much moisture.

In preparing the ashes, Tucker's apparatus was employed, and it was found that the method rendered incineration more easy and checked

volatilisation (Abstr., 1900, ii, 52; Shuttleworth and Tollens, *ibid.*, 111; and Shuttleworth, *ibid.*, 372).
N. H. J. M.

Alkali Soils of the Yellowstone Valley. By MILTON WHITNEY and THOMAS H. MEANS (*U.S. Dept. Agr. Div. of Soils, Bull.*, 1898, 14, pp. 39).—The ultimate source of the alkali is the sandstone. Before irrigation was introduced, the salts were well distributed throughout the soil, which then contained rather large, but not injurious, amounts of alkali.

To get rid of the excess of alkali where it has become localised, a system of drainage will have to be adopted, whilst great care must be exercised in irrigation. In this manner, the original fertility of the soil may be restored in a few years.
N. H. J. M.

Movement of Water and Solutions of Salts in Soil. By S. KRAWKOW (*Chem. Centr.*, 1900, ii, 1084—1085; from *J. Landw.*, 48, 209—222).—The movement of water is much slower in loamy sand than in diluvial sand. The rate and height of capillary movement is in inverse ratio to the amount of moisture. The amount of drainage and the rate are directly proportional to the amount of rain.

In the case of solutions of salts, the rate of upward capillary movement depends on the degree of concentration and not on the nature of the salt. Application of gypsum and calcium carbonate increased the rate of drainage as well as that of the upward capillary movement.
N. H. J. M.

Analytical Chemistry.

Estimation of Nitrites Alone or in the Presence of Nitrates. By HENRI PELLET (*Chem. Centr.*, 1900, ii, 1089; from *Ann. Chim. anal. appl.*, 1900, 5, 361—365).—The author republishes a process given by him in 1879, and based on the fact that in the presence of ferrous salts and hydrochloric acid both nitrates and nitrites yield nitric oxide, but that when acetic acid is substituted for hydrochloric acid only the nitrites are decomposed.
L. DE K.

Estimation of Nitrites and their Separation from Nitrates. By LUCIEN L. DE KONINCK (*Chem. Centr.*, 1900, ii, 1089—1090; from *Ann. Chim. anal. appl.*, 1900, 5, 365—368).—The method proposed by Pellet (preceding abstract) is approved of. A large excess of hydrochloric acid is essential for the reaction when dealing with nitrates. Nitrites are completely decomposed by boiling with ferrous ammonium sulphate alone. In the presence of ammonium chloride, free nitrogen is evolved, but this makes no difference, as the volume of gas evolved is the same.
L. DE K.

Estimation of Arsenic. By O. DUCRU (*Compt. rend.*, 1900, 131, 886—888).—The arsenic is precipitated as ammoniacal cobalt arsenate (this vol., ii, 23), the reagents required being a solution of 75 grams of

cobalt chloride in 1000 c.c. of water and a solution of ammonium acetate prepared by neutralising a 40 per cent. solution of glacial acetic acid with a 20 per cent. solution of ammonia. The arsenic solution is concentrated, acidified if necessary with hydrochloric acid to decompose any alkali carbonates, and then just neutralised with ammonia. Ten c.c. of the cobalt solution for every 100 mgrms. of arsenic present are mixed with one-quarter its volume of the ammonium acetate solution, and to the mixture is added about 3 per cent. of a 20 per cent. solution of ammonia. This reagent and the arsenic solution are mixed and heated in a closed flask on a water-bath until the precipitate becomes crystalline; it is then collected and washed with cold water. The precipitate may be dried at 100° and weighed, when it has the composition $\text{Co}_3(\text{AsO}_4)_2 \cdot \text{NH}_3 \cdot 7\text{H}_2\text{O}$, or it may be heated at dull redness until the weight is constant, which does not yield very good results; or it may be dissolved in dilute acid, the arsenic separated and the cobalt precipitated by electrolysis in presence of ammonium sulphate. The method yields accurate results even with very small quantities of arsenic.

C. H. B.

An Improvement on the Geissler Potash Apparatus. By J. WETZEL (*Ber.*, 1900, 33, 3393—3394).—To insure the complete absorption of carbon dioxide in combustions, where the gas is given off very rapidly, the author proposes the addition of a small moveable inverted funnel in each of the three bulbs, which contain the potash of the usual Geissler apparatus.

R. H. P.

Estimation of Carbon in Ferrochrome. By ANDREW A. BLAIR (*J. Amer. Chem. Soc.*, 1900, 22, 719—723).—Twenty-five grams of pure potassium hydrogen sulphate are placed in a platinum boat 150 mm. long and 25 mm. wide and fused over a bunsen burner to destroy any carbonaceous matter. When cold, 1 gram of the finely powdered sample is sprinkled over it, and the boat is inserted into a larger one, which is then fitted with a cover so arranged that any particles spirted up from the melting mass run into the larger boat; by this means, the combustion tube is kept clean.

The latter consists of a platinum tube 400 mm. long and 30 mm. in diameter closed with a ground joint at the rear. The forward end for a distance of 75 mm. is contracted to 12 mm. and filled with platinised asbestos. It is then further contracted to 6 mm. in diameter and a piece of glass tube filled with glass beads is fused to it after being bent downwards at an angle of 90° . The plugs are made of pumice wrapped with platinum foil and are pushed in after the boat.

It will be noticed that the use of india-rubber stoppers is entirely avoided, which is very essential, as these may be a source of considerable error.

The further details of the process are briefly as follows. The combustion is made in a slow current of purified oxygen, the bulk of the liberated sulphuric acid condenses in the tube containing the beads, and the gases are then passed through two glass flasks kept hot and containing a solution of chromic acid in sulphuric acid to retain any sulphur dioxide. After passing over pumice stone saturated with chromic acid and over dry calcium chloride, the carbon dioxide is

finally absorbed in the usual manner and weighed. The guard tube of the absorption apparatus is connected with a gasometer which acts as an aspirator and relieves the pressure in the apparatus, which otherwise might become excessive owing to the condensation of sulphuric acid in the bent tube.

L. DE K.

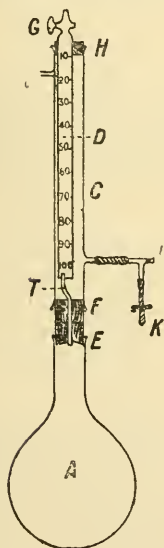
Some Principles and Methods of Rock Analysis. By WILLIAM F. HILLEBRAND (*Bull. U.S. Geol. Survey*, 1900, No. 176, 114 pp.).—This, which is a new and enlarged edition of the first portion of *Bulletin* No. 148 (1897), gives detailed descriptions of the methods employed in the laboratory of the United States Geological Survey for the analysis of silicate rocks and minerals. Several diagrams of apparatus are given, and also a complete index.

L. J. S.

Separation of Tungsten Trioxide from Molybdenum Trioxide. By MAX J. RUEGENBERG and EDGAR F. SMITH (*J. Amer. Chem. Soc.*, 1900, 22, 772—773).—The two oxides may be quantitatively separated by heating them with about 50 times their weight of sulphuric acid of sp. gr. 1.378, which completely dissolves the molybdenum trioxide but leaves the tungsten trioxide undissolved. The presence of even a large excess of ferric oxide does not interfere with the estimation of the tungsten.

L. DE K.

Estimation of Air in Water. By HENRI PELLET (*Chem. Centr.* 1900, ii, 1088—1089; from *Ann. Chim. anal. appl.*, 1900, 5, 369—370).—*A* (see Fig.) is a glass flask, *E* an india-rubber cork with a glass tube *T*, *C* a condenser the cork, *F*, of which rests on *E*. *D* is a graduated tube closed by the stopcock, *G*, and supported by *H*. *I*, *J*, and *K* serve for regulating the refrigerating water.



A is filled with the sample to be tested, the cooling water is admitted into *C*, the burette, *D*, is filled with water by applying suction and connected with *T*. On warming *A*, a portion of the water is expelled, the same volume which flows from *J*, is measured and deducted from the volume of the balloon, *A*. The air from the water collects in *D*, and its volume is measured with due regard to temperature and pressure. The gas may be removed by opening *G*, and further examined.

L. DE K.

Preliminary Operations at the Spring for the Detection of Metals Present in Minute Quantities in Natural Waters.

By F. GARRIGOU (*Compt. rend.*, 1900, 131, 897—899).—In order to avoid the evaporation of large quantities of water, the author collects the water at its source in large vessels of glass or wood, adds excess of barium hydroxide in very fine powder, and agitates briskly. After the precipitate has completely

settled, the clear liquid is drawn off and the precipitate collected in flasks. The liquid is mixed with a slight excess of sulphuric acid, and the precipitate, which carries down with it traces of metals not precipitated by the hydroxide, is also collected. The two precipitates contain all the metals originally present in the water, with the exception of alkali metals.

C. H. B.

Quantitative Reactions to distinguish between Petroleum or Cannel Coal Pitches and Pitches from Distillation of Fats. By D. HOLDE and J. MARCUSSEN (*Ber.*, 1900, 33, 3171—3175).—Soft pitches from fat distillation, stearin pitch, wool pitch, &c., are readily distinguished from the soft and hard pitches from petroleum by means of the large amounts of fatty acids and esters contained in them. Hard wool and stearin pitches are somewhat difficult to differentiate from petroleum pitches, as they contain only small amounts of acids. The distillates from such pitches yield 14—17 per cent. of snow-white paraffin hydrocarbons; the sp. gr. of the distillate is always considerably below 1, as are the sp. grs. of the distillates from petroleum or cannel coal pitches. Coal tar pitch, on the other hand, yields distillates of sp. grs. always above 1.

The best method of distinguishing hard fatty and "mineral oil" pitches is by the aid of a specially prepared alcoholic-ether extract. The extract from hard fatty pitch gives an "acid number" * varying from about 9—23 and an "ester number" from 9—16; the corresponding numbers for a petroleum pitch vary between 0.6 and 3.0 and 3.4 and 5.9.

In the titrations the authors have used a 2 per cent. solution of alkali-blue-6b as indicator.

When the hard fatty pitches are distilled with superheated steam (300°), or even simply distilled, the first distillates always contain appreciable amounts of acid. The authors find that all fatty pitches contain small amounts of copper soaps, obtained from the copper vessels in which the distillation has been carried out. Petroleum pitches, on the other hand, are free from copper.

J. J. S.

New Colour Reaction for Distinguishing between certain Isomeric Allyl and Propenyl Phenols. By ALFRED C. CHAPMAN (*Analyst*, 1900, 25, 313—314).—The reaction is brought about by dissolving 1 c.c. of the phenol in 5 c.c. of acetic anhydride and then adding a fragment of fused zinc chloride or one drop of sulphuric acid.

Eugenol gives, with sulphuric acid, a brown coloration which quickly turns purple and finally wine-red; with zinc chloride, a transitory pale yellow. *iso*Eugenol gives, with sulphuric acid, a rose-pink coloration quickly changing to a light brown; with zinc chloride, a bright rose-pink. Safrole gives, with sulphuric acid, a bright emerald green coloration, becoming brownish-green and finally brownish; with zinc chloride, a pale blue, fading after a time and finally turning light

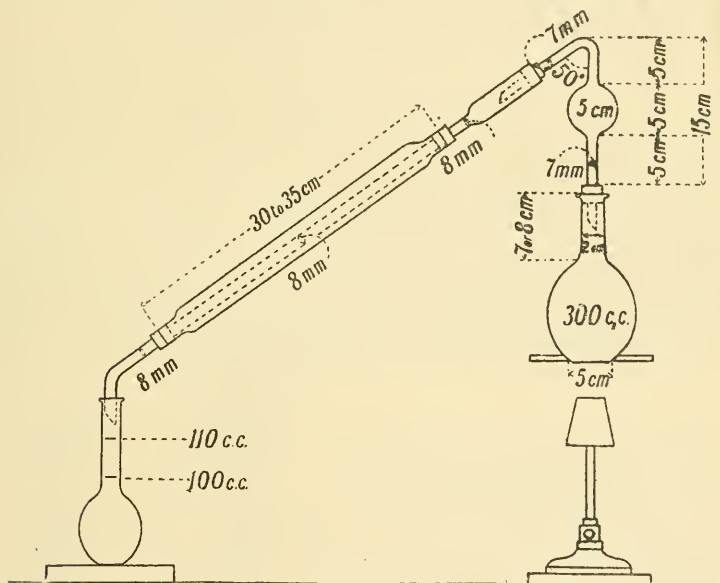
* The acid number indicates the number of milligrams of potassium hydroxide required to neutralise the acid contained in 1 gram of the substance; the ester number gives the number of milligrams of potassium hydroxide required to hydrolyse the esters contained in 1 gram of the substance.

brown. *iso*Safrole gives, with sulphuric acid, a faint, transient pink coloration, turning reddish after a time; with zinc chloride, a pink becoming brownish-pink, and finally brown. Estragol gives, with sulphuric acid, a purple coloration turning to indigo blue and then to bluish-purple; with zinc chloride, a blue-violet, becoming deep mauve and finally brownish. Anethole gives, with sulphuric acid, no coloration at first, but after a short time a yellowish tinge; with zinc chloride, a pale yellow, appearing slowly and deepening on standing, finally becoming brick-red.

Every possible care was taken to ensure the purity of the phenols used in the experiments.

L. DE K.

The Margarine Clause of the Food and Drugs Act. [By THOMAS E. THORPE, WALTER W. FISHER, ALFRED H. ALLEN, EDWARD J. BEVAN, and OTTO HEHNER] (*Analyst*, 1900, 25, 309—313).—A report as to the manner of estimating the proportion of butter fat in margarine, which has been agreed to by the Principal Chemist of the



Government Laboratory and a Committee appointed by the Society of Public Analysts. The method recommended is as follows:

Five grams of the melted and filtered sample are introduced into a 300 c.c. flask (see Fig.), 2 c.c. of aqueous sodium hydroxide (1 : 1) free from carbon dioxide are added, and also 10 c.c. of 92 per cent. alcohol, and the mixture is heated under a reflux condenser, connected with the flask by a T-piece, for 15 minutes in a bath containing boiling water. The alcohol is distilled off by heating the flask on the water-bath for about half an hour, or until the soap is dry. One hundred c.c. of hot water which has been kept boiling for at least 10 minutes are

added, and the flask heated until the soap is dissolved. Forty c.c. of *N*-sulphuric acid and three or four fragments of pumice or broken pipe-stems are added, and the flask is at once connected with the condenser, as indicated in the figure. The flask, which is supported on a circular piece of asbestos 12 cm. in diameter having a hole in the centre 5 cm. in diameter, is first heated with a very small flame, to fuse the insoluble fatty acids without causing the liquid to boil. The heat is then increased, and when fusion is complete 110 c.c. are distilled off into a graduated flask, the distillation lasting about 30 minutes (say from 28 to 32 minutes). The distillate is shaken, 100 c.c. are filtered off, transferred to a beaker, 0.5 c.c. of phenolphthalein solution (1 gram in 100 c.c. of alcohol) added, and the filtrate titrated with *N*/10 sodium or barium hydroxide. As the chemicals used may yield a slightly acid distillate, a blank experiment should be made, and the result allowed for; this should, however, not exceed 0.3 c.c. of *N*/10 alkali. The final result multiplied by 1.1 is the Reichert-Wollny number.

The following table gives, I, the Reichert-Wollny number as determined by this method, and, II, the corresponding amount of butter fat that is assumed to be present in the margarine.

I.	4.0	4.3	4.6	4.9	5.2	5.5	5.9	6.2	6.5	6.8	7.1
II.	10	11	12	13	14	15	16	17	18	19	20

No presumption against the margarine in regard to its content of butter fat should be raised unless the Reichert-Wollny number thus ascertained exceeds 4.

L. DE K.

Ceylon Oil in Margarine and Butter. By W. G. A. INDEMAN (Chem., Centr., 1900, ii, 1134; from *Ned. Tydschr. Pharm.*, 12, 306—310).—The presence of Ceylon oil in butters or margarines renders analysis more difficult on account of the considerable amount of volatile fatty acids which it yields. The adulteration may, however, be detected by combining the Reichert-Meissl number with the refractometer number as shown in the following table:

	Reichert-Meissl number.	Refractometer number.
Pure butter.....	27.13	46.25
Same adulterated with 20 per cent. of foreign fat	21.15	45.5
Margarine No. 1.....	5.87	43.5
Margarine No. 2.....	5.16	44.5
Ceylon oil.....	7.60	36.0
Margarine without Ceylon oil.....	1.32	54.0

L. DE K.

Estimation of Fat in Fæces. By OEFELE (Chem. Centr., 1900, ii, 1137; from *Pharm. Centr. Halle*, 41, 649—651).—The estimation of the fat in the portion of the ethereal extract which is insoluble in water by assuming its saponification number to be 200 is quite untrustworthy; to obtain results which agree with the gravimetric estimation of the fatty acids, the saponification number must be supposed to vary from 92 to 350.

It is recommended to estimate the fat by its ether-number, by

weighing, and by titration so as to get both the normal fat and the fatty acids. L. DE K.

Analytical Chemistry of the Alkaloids. V. Employment of Tannic Acid for Purifying Alkaloid Residues in Chemico-toxicological Analysis. By KARL KIPPENBERGER (*Zeit. anal. Chem.*, 1900, 39, 627—633).—Salkowski's objections (Abstr., 1898, ii, 547) to the author's "glycerotannic acid" method (Abstr., 1895, ii, 465) are admitted, as far as regards the behaviour of Witte's peptone with this reagent, but if the extraction be made at 40° as recommended, none of the proteids present in cadaveric matter will pass into solution, and to the objection that the alkaloid tannates may be partially precipitated by diluting the glycerol solution with much water, it is replied that this occurs only in the absence of acid. The author originally proposed the addition of tartaric acid; hydrochloric acid is even better. He, however, admits that the extraction of the glycerol solution by chloroform is an inconvenient operation. On the other hand, Salkowski's proposal to treat the alkaloid tannates with hide powder does not succeed in the case of alkaloids, such as brucine, which form very insoluble tannates. A more convenient solvent than glycerol for the alkaloid tannates is found in acetone, in which the freshly precipitated tannates of brucine, strychnine, atropine, morphine, aconitine, veratrine, papaverine, narceine, thebaine, codeine, emetine, nicotine, coniine, sparteine, quinine, narcotine, and cocaine dissolve readily. The majority of the proteid tannates, including Witte's peptone, are insoluble in acetone, although there exist commercial peptones, of which traces dissolve. The presence of hydrochloric acid is to be avoided when extracting with acetone. Having obtained the acetone solution, a small quantity of glycerol and some dilute hydrochloric acid should be added before evaporating the acetone, and an aqueous solution is then obtained which is well suited for the extraction with chloroform. The acetone method is of course useless where volatile alkaloids have to be searched for.

M. J. S.

Estimation of Proteids in Fodder. By HENRIK SCHJERNING (*Zeit. anal. Chem.*, 1900, 39, 633—639).—The author has now applied his method of precipitation by uranium acetate (Abstr., 1898, ii, 658; 1900, ii, 779) to the estimation of the total proteids in various feeding stuffs, in comparison with Stutzer's method, which has generally been employed for the purpose. In consequence of the absence from most fodders of the peptones which Stutzer's reagent fails to precipitate, the two methods give in most cases closely concordant results. In the case of sunflower-seed cake and cotton-seed cake Stutzer's reagent gave slightly the higher numbers, a result which is probably due to the precipitation of amino-compounds. Special experiments showed that the uranium process was not interfered with by the presence of such non-proteid nitrogenous substances as piperazine, arginine, asparagine, &c. The estimation is carried out as follows: 0.5—1 gram of the substance is digested at the ordinary temperature with 100 c.c. of water for 20 hours; the mixture is then heated to 50°, and 20 to 40 c.c. of saturated solution of uranium acetate (which should be free

from basic salt) are added. The mixture is kept at 50° for half an hour, direct light being excluded, and the precipitate collected on an extracted filter and washed with a cold 1—2 per cent. solution of uranium acetate. It is then evaporated nearly to dryness with addition of a little magnesia (Abstr., 1900, ii, 780) and the nitrogen is estimated by Kjeldahl's process, adding 0.1 c.c. of $N/10$ acid for every 100 c.c. of filtrate.

M. J. S.

Uniformity in Soil Analyses. By A. D. HALL (*Analyst*, 1900, 25, 281—286).—Recommendations of the Committee of the Agricultural Education Association, having for their object the securing of a certain uniformity in soil analyses.

1. *Taking sample.*—This should be taken at a depth of 9 inches, but in the case of shallow soils at such a depth as marks a natural line of demarcation. 2. *Drying.*—The sample should be air-dried. The drying may be accelerated by warming for some time at 40° . 3. *Sifting.*—A sieve with round holes 3 mm. in diameter should be used to separate the fine earth from the stones and gravel. Aggregates of clay and silt may be broken up with a wooden pestle, but stones or lumps of chalk should not be crushed. For the determination of the available constituents, the fine earth is used without grinding, but in other cases it is sifted through a woven sieve of 40 meshes to the inch, or a sieve with round holes of 1 mm. in diameter. 4. *Estimation of moisture.*—The sample should be dried in the steam-oven to constant weight. 5. *Determination of loss on ignition.*—The result should be corrected for moisture and for any carbon dioxide expelled from the carbonates. 6. *Determination of nitrogen.*—Kjeldahl's process should be used. 7. *Determination of calcium carbonate.*—This is calculated from the carbon dioxide evolved when the fine earth is treated with an acid, no discrimination being made between calcium and magnesium carbonate. 8. *Determination of total mineral constituents.*—The fine earth is first boiled with strong acid in an open flask and then digested in a loosely-stoppered flask on the water-bath for 40—48 hours. In this solution, the phosphoric acid, potash, and, if necessary, other mineral constituents are determined. 9. *Determination of available phosphoric acid and potash.*—Dyer's citric acid process (*Trans.*, 1894, 65, 115) is recommended. 10. *Expression of results.*—Unless otherwise stated, results should be expressed as percentages calculated on the fine earth in an air-dry state.

Experiments have been made with the object of supporting these recommendations. It has been found that hydrochloric acid acts more satisfactorily than nitric acid. As a rule, the ignited soil yielded more potash and less phosphoric acid than the raw sample.

L. DE K. 550

General and Physical Chemistry.

Lamps for Spectra. III. By ERNST BECKMANN (*Zeit. physikal. Chem.*, 1900, 35, 652—660).—The paper contains a description and an illustration of an elaborate lamp constructed on the lines previously indicated (Abstr., 1900, ii, 701; this vol., ii, 53), and suitable for all sorts of spectroscopic investigations. In another lamp, capable of giving monochromatic light for polarimeter and refractometer work, the flame is circular, and the spray is produced either electrolytically or with the porous porcelain tube previously described. To secure an intense sodium flame, hydrogen should be substituted for coal gas, and the salts used should be those which readily give up oxygen, namely, chlorate, perchlorate, nitrate, or peroxide. J. C. P.

Arc Spectra of some Metals as Influenced by an Atmosphere of Hydrogen. By HENRY CREW (*Phil. Mag.*, [v], 50, 497—505).—It was found that arc spectra of metals are modified when the arc is formed in an atmosphere of hydrogen, some of the lines being enhanced, some weakened, and others not affected. The modifications of zinc and magnesium spectra and for a portion of the iron spectra are indicated by tables. From these, it is observed that all the lines in the arc spectrum which are affected by the hydrogen atmosphere belong also to the spark spectrum, whilst, on the contrary, those lines which belong to Kayser and Runge's series are not affected. L. M. J.

Differences of Potential between Metals and Non-aqueous Solutions of their Salts. II. By LOUIS KAHLENBERG (*J. Physical Chem.*, 1900, 4, 709—714. Compare Abstr., 1899, ii, 624).—The E.M.F.'s of a number of non-aqueous concentration cells were determined; the ratio of the ion concentrations in the solutions were calculated from the molecular conductivities and the E.M.F.'s calculated by the well-known Nernst formula: $\pi = RT/ne \cdot \log c_1/c_2$. The cells employed were (1) $\text{Ag.N}/10\text{AgNO}_3.\text{N}/100\text{AgNO}_3.\text{Ag}$; (2) $\text{Ag.N}/10\text{AgNO}_3.\text{N}/500\text{AgNO}_3.\text{Ag}$;

(3) $\text{Ag.N}/10\text{AgNO}_3.\text{N}/1000\text{AgNO}_3.\text{Ag}$, in pyridine solutions; (4) $\text{Ag.N}/8\text{AgNO}_3.\text{N}/128\text{AgNO}_3.\text{Ag}$ in acetonitrile; (5) $\text{Cd.N}/48.9\text{CdI}_2.\text{N}/214.7\text{CdI}_2.\text{Cd}$ in acetonitrile. The determinations gave the following values in volts for the E.M.F. (1) 0.035, (2) 0.061, (3) 0.076, (4) 0.046, (5) 0.032, whilst those calculated were (1) 0.052, (2) 0.085, (3) 0.099, (4) 0.050, (5) 0.017 volt. Owing to these discrepancies, the author considers that Nernst's expression cannot be applied to non-aqueous solutions, and considers it desirable that the formula should be subjected to rigid tests in aqueous solutions (compare, however, Jahn, Abstr., 1900, ii, 707). L. M. J.

The Chlorine-Hydrogen Gas Cell. By IWAN AKUNOFF (*Zeit. Elektrochem.*, 1900, 7, 354—356).—The author finds the E.M.F. of the hydrogen-chlorine gas cell (the electrolyte being 3-normal hydrochloric acid saturated with potassium chloride) to be 1.37125—0.000855*t* volts

From this result, the heat developed by the reaction which gives rise to the E.M.F. is calculated by means of Helmholtz's formula to be 37,107 cal. The heat of formation of hydrochloric acid in the above-mentioned solution from gaseous hydrogen and chlorine at constant pressure is 37,680 cal.

Müller (*Zeit. Elektrochem.*, 1900, 6, 573) has supposed the reaction to be $\text{H}_2 + \text{HClO} = \text{H}_2\text{O} + \text{HCl}$; this would, however, develop 38,850 cal. It is therefore probable that the E.M.F. of the cell is due to the direct union of hydrogen and chlorine. T. E.

Poynting's Theorem. By P. S. WEDELL-WEDELLSBORG (*Zeit. physikal. Chem.*, 1900, 35, 604—607).—A criticism, from a purely physical standpoint, of Mie's paper (*Abstr.*, 1900, ii, 703), and a summary of the differences between the author's views and those of Poynting and Thomson. J. C. P.

Electrical Conductivity of Aqueous Solutions of Alkali Chlorides and Nitrates. By FRIEDRICH KOHLRAUSCH and MARGARET E. MALTBY (*Wiss. Abhandl. phys.-tech. Reichsanstalt*, 1900, 3, 155—227).—An account of this work has already appeared (see *Abstr.*, 1900, ii, 61), but the present paper contains very much fuller details of the experimental data. J. C. P.

Electromotive Force and Optical Constants of Chromium. By F. JULES MICHELI (*Chem. Centr.*, 1900, ii, 809; from *Arch. Sci. phys. nat. Genève*, [iv], 10, 122—131).—When the metals are arranged in the order of their electromotive efficiency, chromium in the inactive condition stands near platinum, in the active condition immediately after zinc (compare Hittorf, *Abstr.*, 1898, ii, 363; 1900, ii, 127). Optical investigation must throw light, as in the case of iron, on the question whether the existence of the active and inactive states is due to two different modifications of chromium, or to a superficial layer of oxide in the latter case. The author finds, by an optical method, that there is no such layer of oxide formed. According to Hittorf and to Ostwald (*Abstr.*, 1900, ii, 730; this vol., ii, 24), chromium which has been rendered active becomes inactive if left exposed to the air; the author, on the other hand, finds that chromium which has been rendered inactive gradually assumes the active condition. According to Hittorf, the activity of chromium can be increased by immersion in fused zinc chloride; optical investigation reveals, in this case, the presence of a coating of oxide; subsequent immersion in nitric acid renders the chromium inactive, without in any way affecting the layer of oxide. J. C. P.

Concentration at the Electrodes in a Solution, with special reference to the Liberation of Hydrogen in the Electrolysis of a Mixture of Copper Sulphate and Sulphuric Acid. By HENRY J. S. SAND (*Compt. rend.*, 1900, 131, 992—995; *Phil. Mag.*, 1901, [vi], 1, 45—79).—An expression is deduced for the concentration at an electrode of infinite area, in terms of the time, current, and diffusion coefficient. In mixtures, however, a formula cannot be deduced, but limiting values may be calculated between which the actual concentration should lie. These were applied to

calculate the time in which the concentration of copper at an electrode in a mixture of copper sulphate and sulphuric acid would become zero, and the liberation of hydrogen would hence commence. The observed time was found in all cases to lie between the calculated limits. The calculations assume the absence of convection currents, the liberation of hydrogen being completely prevented by vigorous stirring

L. M. J.

Electro-capillary Properties of Mixtures, and Electro-capillary Viscosity. By A. GOUY (*Compt. rend.*, 1900, 131, 835—837).—If the curves for electro-capillarity against potential difference be taken in the case of (1) an aqueous solution of a pure compound *A*, and (2) the same solution to which a small quantity of a second compound, *B*, is added, it is found that in general these coincide for strong negative polarisations. If, however, the compound *B* is an 'active' compound, for example, an iodide or bromide, a variation of the maximum occurs, and near the maximum the curve resembles that of the solution of *B*, even though its concentration be very small compared with that of *A*. This variation of the maximum may attain the value of 0.2 volt, so that the maximum value does not always correspond with zero difference of potential. In these mixtures also, the mercury only slowly reaches its stable position and this effect, which the author terms electro-capillary viscosity, is explained by the supposition of the accumulation at the mercurial surface of the 'active' anions, the slow establishment of equilibrium being due to the slight concentration of these in comparison with the other ions.

L. M. J.

Measurement of the Velocity of Gaseous Evolutions. Application to the Voltameter. By ANDRÉ JOB (*Bull. Soc. Chim.*, 1901, [iii], 25, 7—9).—If a gas is allowed to escape through a long capillary tube from the vessel in which it is being evolved, the excess of the pressure of the gas in the vessel over that of the external air is a measure of the rate of evolution of the gas at any instant. Use may be made of this principle in the continuous study of processes of fermentation, of the dissolution of metals in acids, and of other reactions in which gases are evolved; the method has been recently employed by Ostwald (this vol., ii, 24) and Bredig and Hahn (*Zeit. Elektrochem.*, 1900, 7, 254) for such purposes. A voltameter, when provided with a water manometer and a capillary exit tube, becomes virtually an amperemeter, the excess of pressure being proportional to the rate of evolution of gas, and hence also to the intensity of the current, at any instant.

N. L.

Magnetism and Atomic Weight. By LEO ERRERA (*Bull. Roy. Acad. Belg.*, 1900, 152—161).—The author reviews critically the work of Königsberger (*Ann. Phys. Chem.*, 1898, [ii], 66, 698) and Meyer (Abstr., 1899, ii, 587; 1900, ii, 7). It is simpler to connect the magnetism of the elements directly with their atomic weight, rather than with their atomic volume, and a table is drawn up showing the connection referred to.

J. C. P.

Thermal and Electrical Conductivity, Thermal Capacity, and Thermo-electric Efficiency of some Metals. By WILHELM JAEGER and H. DIESELHORST (*Wiss. Abh. phys.-tech. Reichsanstalt*, 1900, 3, 269—424).—The chief result of this exhaustive investigation is the confirmation of the law of Wiedemann and Franz for copper, silver, gold, nickel, zinc, cadmium, lead, and tin. For these metals, the ratio λ/K , where λ is the thermal and K the electrical conductivity, is, as required by the law, constant, although considerable deviations are found in some cases. The law of Lorenz is also applicable, according to which the above ratio is proportional to the absolute temperature. The exceptionally high value of the ratio in the case of iron is attributed to impurity (compare Grüneisen, *Ann. Phys.*, 1900, [iv], 3, 43). This is borne out by the investigation of alloys, for when a metal B is added to a metal A , the ratio λ/K for the alloy is greater than for the pure metal A . Platinum and palladium are peculiar in giving an exceptionally large value both for the ratio λ/K and its temperature coefficient. Aluminium shows a low value of the ratio λ/K , but a large temperature coefficient, whilst the opposite holds for bismuth.

J. C. P.

Thermal and Electrical Conductivity of Copper-Phosphorus and Copper-Arsenic. By A. RIETZSCH (*Ann. Phys.*, 1900, [iv], 3, 403—427).—By the introduction of small quantities of phosphorus and arsenic, the thermal conductivity (λ) of copper is diminished more than is its electrical conductivity (K). Thus if for pure copper both λ and K are put = 100, then for an alloy containing 0.87 per cent. of phosphorus $\lambda = 16$, $K = 20.6$, and for one with 5.25 per cent. of phosphorus, $\lambda = 4$, $K = 5.6$. Similar series of numbers are obtained for copper-arsenic. The influence of non-metals on the conductivities (thermal and electrical) of metals is opposite to that of other metals (compare preceding abstract).

J. C. P.

Molecular Specific Heats of Dissociable Gaseous Compounds. By A. PONSOT (*Compt. rend.*, 1900, 131, 990—992).—A mathematical paper, in which the author deduces that at extreme limits of rarefaction the molecular specific heat of a gaseous compound is less than that of the mixture of its dissociation products, whether at constant pressure or constant volume; in the latter case, the difference may be regarded as approximately zero.

L. M. J.

Air Thermometer at High Temperatures. By LUDWIG HOLBORN and ARTHUR DAY (*Ann. Phys.*, 1900, [iv], 2, 505—545).—The authors have studied the conditions which must be observed if a gas thermometer is to be used with confidence at high temperatures. The reservoir should be of platinum-iridium, and nitrogen should be used as the expanding gas. With this standard gas thermometer, they have compared a platinum-platinum rhodium thermo-couple, the E.M.F. of which, for the temperature interval of the experiments, 300—1150°, is given by an equation of the second degree. This thermo-couple was further used to determine the melting points of several metals by one of two methods. Either a short wire of the metal under observation was introduced into the junction of the thermo-

couple, and the E.M.F. noted at the time of its fusion, or a larger quantity was put in a crucible, and the thermo-element, protected by a porcelain tube, immersed in the fused metal.

The following melting points were determined :

Gold (wire method).....	1064·0°	Antimony (crucible) ...	630·5°
Silver (wire method)	953·6	Aluminium (crucible) ..	657·3
Silver (crucible, air admitted)	954·9	Zinc (crucible)	419·0
Silver (crucible, air excluded)	961·5	Lead (crucible)	326·9
Copper (oxidising atmosphere)	1065·0	Cadmium (crucible) ...	321·7
Copper (reducing atmosphere)	1084·0		

The authors consider that up to 1150° the correct temperature can be determined to within 1° with the use of a thermo-couple. The melting points of the metals, as above determined, are compared with the values obtained by Heycock and Neville (*Trans.*, 1895, 67, 160, 1024), and Callendar (*Phil. Mag.*, 1899, [v], 48, 519). J. C. P.

Melting Point of Gold. By LUDWIG HOLBORN and ARTHUR DAY (*Ann. Phys.*, 1901, [iv], 4, 99—103).—The melting point of gold as determined by the crucible method (see preceding abstract) is 1063·5°. The value obtained by the wire method for the same sample is 1063·9°. The authors think that in standardising thermo-couples the wire method may advantageously be used for determining the melting point of gold. J. C. P.

Change of Temperature attending the Solidification of Melted Organic Substances. By BRONISLAW PAWLEWSKI (*Ber.*, 1900, 33, 3727—3731).—The substance (5 grams) was placed in a test-tube so as to surround the bulb of a thermometer; this tube was placed in a wider one. The temperature was then raised, by means of a gas burner, to 20—40° above the melting point of the substance, the apparatus allowed to cool, and the temperature read every 20 seconds and plotted against the time. Three types of curves were obtained; in the first, the temperature falls rapidly, then remains constant for a time, and finally falls again; in the second, it falls rapidly, then more slowly for a time, and finally more rapidly again; in the third, it falls rapidly, the substance becoming overcooled (in one case by as much as 40°), then rises rapidly as the substance solidifies, keeps constant for a time, and finally falls once more. The interval of constant temperature, or that where the fall is slow, is in all cases below the melting point observed in a capillary tube.

To the first type belong *p*-dichlorobenzene, *p*-dibromobenzene, *p*-chloronitrobenzene, *p*-nitrophenol, *p*-toluidine, *o*-dichloroxylylene, *m*-nitroaniline, triphenylmethane, diphenyl, naphthalene, acenaphthene, stearic acid, phenylacetic acid, catechol, benzamide, methyl oxalate, azobenzene, formanisidine, acetanilide, diphenylamine, β -naphthol, β -naphthylamine, &c. To the second, camphoroxime, benzylaniline, guaiacol, anisic acid. To the third, benzil, benzoin, benzylideneacetone, chloroacetic acid, *m*-nitrochlorobenzene, chloral hydrate, *p*-chloroaniline, *p*-toluonitrile, α -naphthylamine, vanillin, coumarin, phenol, phthalide, formanilide, resorcinol, acetyldiphenylamine, &c. C. F. B.

Cryoscopic Researches. By PAUL CHRUSTCHOFF (*Compt. rend.*, 1900, 131, 883—886).—In view of many discrepancies in cryoscopic observations, a new method was employed in which the temperatures were taken by a Callender and Griffiths' thermometer, the position along the wire of the Wheatstone bridge being read by a micrometer eyepiece; a displacement of 0.2 mm. along the wire indicated a difference of temperature of 0.001°. The usual precautions regarding stirring, &c., were observed, and the observed depressions are given in scale readings, not in degrees, the rates of these depressions to concentration being recorded. It is found that this ratio remains constant on dilution for sodium chloride, decreases for potassium bromide, and increases for sucrose and for potassium sulphate. L. M. J.

Dupré-Rankine Vapour Tension Law. By PAUL JULIUSBURGER (*Ann. Phys.*, 1900, [iv], 3, 618—659).—The law is expressed in the equation $\log P = A - B/T - C \log T$, and the author finds that the various ways of deducing it are all equally valid. Theoretically, the law holds strictly only when the tension is small, but practically it is applicable over a wide range, for some substances even up to the critical temperature. The formula may also be used in cases where P is the dissociation pressure of a system. J. C. P.

Vapour Tension of Water at Temperatures between -12° and 25°, especially at 0°. By MAX THIESEN and KARL SCHEEL (*Wiss. Abh. phys.-tech. Reichsanstalt*, 1900, 3, 71—94).—The mean value of the vapour tension of water at 0°, as determined in a number of very careful measurements, is 4.575 mm. J. C. P.

Experiments on Fractional Distillation. By SYDNEY YOUNG (*J. Soc. Chem. Ind.*, 1900, 19, 1072—1075).—The rate at which a mixture is distilled largely influences the extent of the separation effected; for efficiency, the number of drops per minute should not exceed 60, and good contact should be ensured between the ascending vapour and the condensed liquid (compare *Trans.*, 1899, 75, 679). The value of plotting curves between the weight of each fraction and its temperature range as a means of recognising the boiling point of the ingredients of a mixture, is discussed with reference to a former paper (Thomas and Young, *Proc.*, 1895, 172); the isolation of hexamethylene from American petroleum is also dealt with (compare Fortey, *Trans.*, 1898, 73, 932).

A method is described for ascertaining approximately, without completely separating them, the proportion of the constituents of a liquid mixture, for instance, one containing 31.7 per cent. of methyl acetate, 38.2 of ethyl acetate, and 30.1 of propyl acetate; the boiling points of the esters are 57.1°, 77.15°, and 101.55°, and the two middle points 67.1° and 89.35°. It is found that after a few fractionations the percentage of the mixture boiling below 67.1° remains constant (30.5 per cent.), and represents the proportion of methyl acetate; the proportion boiling below 89.35° is also constant, namely 69.3 per cent., and 69.3—30.5 or 38.8 represents the proportion of ethyl acetate present, whence by difference the amount of propyl acetate is 30.7 per cent. This method is shown to hold for other homologues (for instance,

benzene and toluene, mixed in the proportions 1:9 and 9:1), but additional experiments will be necessary to ascertain whether it is available for substances which are not homologous. It is essential that the rate of distillation should remain nearly constant.

W. A. D.

Distillation in a Vacuum with Hempel's Dephlegmator. By WILHELM HIRSCHL (*Chem. Centr.*, 1900, ii, 1193—1194; from *Oesterr. Chem. Zeit.*, 3, 517).—When Hempel's dephlegmator is used for the distillation of liquids in a vacuum, the usual tendency of the liquid to accumulate in the glass beads instead of running back into the flask becomes so marked that satisfactory distillation is often impossible. This disadvantage may be avoided by inserting a platinum spiral in the wider tube and of the same diameter in such a way that the glass beads are raised and do not rest directly on the constricted portion; the lower tube also requires to be at least 15 mm. in diameter and is fused on to the neck of the distilling flask.

E. W. W.

Determination of Vapour Density under Reduced Pressure. By CARL SCHALL (*J. pr. Chem.*, 1900, [ii], 62, 536—542. Compare Bleier and Kohn, *Abstr.*, 1899, ii, 643).—This paper contains the discussion of a formula for the calculation of K , a constant of the apparatus employed by the author for the determination of vapour density under diminished pressure (*Abstr.*, 1889, 331).

E. G.

Vapour Pressure of a Series of Benzene Compounds. By BENEDIKT WORINGER (*Zeit. physikal. Chem.*, 1900, 35, 723—724).—A reply to Winkelmann's criticism (this vol., ii, 57) of the author's previous work (*Abstr.*, 1900, ii, 709).

J. C. P.

Exact Relation between Osmotic Pressure and Vapour Pressure. By ARTHUR A. NOYES (*Zeit. physikal. Chem.*, 1900, 35, 707—721. Compare *Abstr.*, 1897, ii, 395; 1899, ii, 357).—The exact thermodynamical relation between the osmotic pressure P_1 and the vapour pressure p_1 of a solution, is given by the equation

$$\int_{p_1}^{p_0} v \cdot dp = (P_1 + p_0 - p_1) V_0 \left[1 + \frac{k_0}{2} (P_1 + p_0 - p_1) \right], \text{ where } p_0, V_0, k_0, \text{ are}$$

respectively the vapour pressure, the specific volume, and the coefficient of compressibility of the liquid solvent. The only supposition made in the deduction of this equation is that k_0 is constant between the pressures p_0 and $p_1 - P_1$. Seeing that the latter pressure is generally negative, the value of k_0 has to be got by extrapolation, a process which is justified especially by the work of Worthington (*Phil. Trans.*, 1893, 183, 355). From the above equation, it follows that to calculate the osmotic pressure from the vapour pressure integral, the latter should be divided by the ordinary specific volume of the solvent, and not, as is usually done, by the volume change of the solution. In the course of the paper, the author replies to the criticism of Dieterici (*Abstr.*, 1899, ii, 547).

J. C. P.

Osmotic Pressure of Complex Solutions. By ALEXANDER A. JAKOWKIN (*J. Russ. Phys. Chem. Soc.*, 1900, 32, 721—727).—From

theoretical considerations, the author arrives at the following expression, which relates to the osmotic pressure of a solution of a substance in a mixture of two solvents: $(P_0/P)^m = (p_0/p)^n$, where p represents the partial pressure of one of the solvents for the solution, determined in a Pfeffer's cell, p_0 its partial pressure for the complex solvent, and m the molecular weight of the solvent in the gaseous state; P , P_0 , and M represent the corresponding magnitudes for the second solvent. The above expression simplifies to: $P_0/p_0^k = P/p^k$, where k stands for the ratio of the molecular weights of the two liquids, $M:m$.

T. H. P.

Theory of the Capillary Layer between the Homogeneous Phases of Liquid and Vapour. By G. BAKKER (*Zeit. physikal. Chem.*, 1900, 35, 598—603).—A mathematical paper, unsuitable for abstraction.

J. C. P.

Dissociation of Antimony Pentachloride. By MARCEL NOTHOMB (*Bull. Roy. Acad. Belg.*, 1900, 551—558).—The normal vapour density of antimony pentachloride is 10.35, but in the interval 180—360°, the value obtained by Victor Meyer's method, gradually falls from 7.58 to 5.34. The application of Planck's law to this case

leads to the equation $c_2^2/c_1 = a.e^{\frac{b}{\theta}}.\theta/p$, where c_1 and c_2 are the concentrations of the undissociated molecules and the products of dissociation respectively, θ is the absolute temperature, p is the pressure in mm. of mercury, a and b are constants. The values calculated for the dissociation by this equation agree closely with those actually obtained.

J. C. P.

Reaction Velocity and Equilibrium. By WILDER D. BANCROFT (*J. Physical Chem.*, 1900, 4, 705—708).—Abnormal reaction velocities have been explained by the assumption that the reaction proceeds in two or more stages, on one only of which depends the experimentally found velocity. Inasmuch as this has not hitherto been found in the case of a reversible reaction, it is sometimes assumed that irreversibility is a necessary condition for the production of these abnormal velocities. Suppose, however, a reversible reaction is represented by the equation $2A + B = A_2B$; the equilibrium equation is then $x = k(A - x)^2(b - x)$. If, however, the reaction proceeds in two stages $A + B = AB$; $AB + A = A_2B$, then the final equilibrium is given by $x = k(a - x - y/2)^2.(b - x - y)$, and since the intermediate product is finally of concentration practically zero, this reduces to the first expression, so that the equilibrium result would lead to an equation of the third order, although the reaction velocity might be of the second order, and abnormal velocities may occur in reversible reactions. The author hence protests against the practice of deducing equilibrium relations from reaction velocities instead of solely from the stoichiometric relations.

L. M. J.

Velocity of Intramolecular Migration of Bromoamides under the Influence of an Alkali. By W. VAN DAM and J. H. ABERSON (*Rec. Trav. Pays. Bas.*, 1900, 19, 318—331).—The transformation of bromoamides under the influence of potassium hydroxide

has been previously found to be a reaction of the first order (van Dam, *Abstr.*, 1900, i, 171). This indicates that the transformation is really an intramolecular change and not a reaction between two molecules. The effect of concentration of alkali was investigated, and it was found that for concentrations above $N/2$ the curve for velocity constant against concentration was a straight line. For lower concentrations, however, the velocity constant increases during the progress of the reaction, and it was found that a different reaction also proceeds by which benzoylphenylcarbamide is produced. The action of primary and secondary amines was also investigated; these were found to occasion condensation without the formation of aniline, but values for a reaction velocity constant were not obtained. The effect of temperature between 16° and 33° was found to be in accord with Arrhenius' formula, $\log k_1/k_2 = A.(T_1 - T_2)/T_1.T_2$, the value for A being 14.48. The velocity constants for $N/4$ potassium, sodium, and lithium hydroxides are in the ratio 175 : 166 : 158, the conductivities of the same solutions being in the ratio 175 : 154 : 140; on the same scale, the values for barium and strontium hydroxides are 169 and 169, but lack of data prevent the comparison with conductivity.

L. M. J.

Inversion of Cane Sugar. By EDMUND O. VON LIPPMANN (*Ber.*, 1901, 33, 3560—3564).—A criticism of the theories of Arrhenius (*Abstr.*, 1889, 1103; 1899, ii, 359), Rothmund (*ibid.*, 1896, ii, 593), Sigmund (*ibid.*, 1899, ii, 146), and Euler (*ibid.*, 1900, ii, 269).

A. L.

Theory of Solutions. By GUSTAV JAUMANN (*Ann. Phys.*, 1900, [iv], 3, 578—617).—The object of the paper is to make the theory of solutions independent of Arrhenius' ionic hypothesis, and to connect it with the Faraday-Maxwell theory. The author attacks the basis of the molecular theory, and regards Avogadro's hypothesis as unnatural; the new basis suggested in the paper involves the introduction of simpler chemical formulæ than are used at present.

J. C. P.

Solvent Action of Vapours. By AZARIAH T. LINCOLN (*J. Physical Chem.*, 1900, 4, 715—731).—The author discusses the question of a solvent action of vapour, and considers it probable that such solvent action exists. The vapour pressure curves for benzoic and salicylic acids were determined between 80° and 190° , and it was found that the acids were present in the vapours passing from saturated solutions boiling at various pressures. No conclusive results concerning a solvent action of the vapour were obtained, however, inasmuch as the quantities of acid present in the vapour were no greater than those corresponding with the vapour pressure of the solid at the temperature of ebullition. To obtain decisive results, experiments at a considerably higher temperature and pressure are necessary.

L. M. J.

Dilute Solutions. By N. TARUGI and GIUSEPPE BOMBARDINI (*Gazzetta*, 1900, 30, ii, 405—420).—The degree of dissociation of a number of aqueous salt solutions of various strengths has been determined, (1) from the depression of the freezing point, (2) from the

lowering of the vapour pressure, and (3) from the electrical conductivity of the solutions. The salts examined were cobalt chloride, ferrous sulphate, and the sulphates of cobalt, nickel, manganese, aluminium, copper, cadmium, sodium, and zinc. The results obtained by the first two methods agree fairly well among themselves, but in some cases differ considerably from those yielded by the third method. The experiments show that nickel, cobalt, and manganese salts can exist completely undissociated in solutions coloured respectively green, red, and pink.

T. H. P.

Size of the Particles present in Colloidal Solutions or pseudo-Solutions. By C. A. LOBRY DE BRUYN (*Rec. Trav. Chim.*, 1900, 19, 251—258).—According to the laws of optics, the smallest particles capable of polarising the light reflected from them are 50—100 times smaller than the wave-length of light. Assuming a mean wave-length of 0.5μ , the diameter of such particles is therefore $5\text{--}10 \mu\mu$. The value deduced in this way from purely physical considerations is in agreement with that calculated from chemical data. Thus, Brown and Millar's researches on starch hydrolysis (*Trans.*, 1899, 75, 331) have led them to assign to soluble starch a molecular weight of about 32,500, and an almost identical result has been arrived at by Rodewald and Kattein (*Abstr.*, 1900, i, 477) from a study of starch iodide. Since van der Waals estimates the diameter of ordinary gaseous molecules as $0.1\text{--}0.3 \mu\mu$, and Jäger assigns the value $0.66 \mu\mu$ to the chlorine molecule, it follows, assuming that the specific volumes of the molecules are approximately equal, that the starch molecule has a diameter of about $5 \mu\mu$, as before.

The author comments on the work of previous investigators, and emphasises his opinion that there is no real distinction between true solutions and pseudo- or colloidal solutions. There is no criterion of the homogeneity or heterogeneity of a liquid, and it is possible to pass continuously from undoubted solutions to liquids containing obvious particles in suspension.

N. L.

Method of obtaining Crystals in a Solution without Formation of Superficial Crust. By AUGUSTIN WRÓBLEWSKI (*Bull. Acad. Sci. Cracow*, 1900, 319—325; *Zeit. physikal. Chem.*, 1901, 36, 84—86).—The tube with the solution is closed at the bottom by a membrane of vegetable parchment, and fits tightly in the neck of a surrounding larger bottle, containing pieces of calcium chloride. As the solution is shut off from the air by a U-tube containing water, evaporation takes place only through the parchment, and crystals are formed in the solution when it has become sufficiently concentrated. The method has been successfully applied in the crystallisation of ammonium sulphate and other inorganic compounds, also in the preparation of diastase (compare the author's previous work, *Abstr.*, 1898, i, 500, 713); in this way, crystals of albuminous substances can be obtained in a purer state than by Hoffmeister's method.

J. C. P.

Crystallisation of difficultly Crystallisable Substances. By A. RÜMLER (*Ber.*, 1900, 33, 3474—3475).—Substances which are soluble in water but insoluble in alcohol can be obtained crystalline

by adding alcohol to the aqueous solution until a turbidity appears, filtering, and evaporating slowly in a vacuum over quicklime. By this method, the author has obtained crystals of peptone (prepared from gelatin or from albumin) and of arabic acid from gum arabic.

W. A. D.

Lecture Experiments Illustrating the Electrolytic Dissociation Theory and the Laws of the Velocity and Equilibrium of Chemical Change. By ARTHUR A. NOYES and A. A. BLANCHARD (*J. Amer. Chem. Soc.*, 1900, 22, 726—752; *Zeit. physikal. Chem.*, 1901, 36, 1—27).—Full descriptions are given of seventeen experiments, for the details of which reference must be made to the original.

That colour is an additive property in salt solutions is shown by adding water to alcoholic solutions of copper and cobalt salts. The different rates of double decompositions in inorganic and organic systems are illustrated by the action of silver nitrate on potassium bromide, isopropyl bromide, ethyl bromide, and bromobenzene, all in alcoholic solution. Experiments are described showing the nature of the ions in salt solutions, and their rates of migration during the passage of a current. Simple apparatus serves to show the increase of molecular conductivity with dilution, as well as the different molecular conductivities of equivalent solutions of hydrochloric, sulphuric, monochloroacetic, and acetic acids.

The reaction between potassium iodide and bromate (Abstr., 1896, ii, 470) is used to illustrate the influence of the concentrations of the reacting substances, and the catalytic efficiency of different acids; that the dissociation and consequently the catalytic efficiency of a weak acid is diminished by the addition of a neutral salt may be shown by the same reaction. The influence exerted by strong acids on the dissociation of weak acids is illustrated by several experiments with indicators. When to a saturated solution of a salt *A* a salt *B* with a common ion is added, the salt *A* is partly thrown out of solution; this principle is illustrated by adding either sodium acetate or silver nitrate to a saturated solution of silver acetate.

J. C. P.

New Dropping and Separating Funnels. By P. N. RAIKOW (*Chem. Zeit.*, 1900, 24, 1089—1090).—These funnels are essentially constructed as follows. The top of the stem enters the bulb and represents the outer casing of a stopcock. This has an opening of about 3—4 mm. diameter which is placed so low that the liquid may run completely out of the bulb. To this outer casing is fitted a tube, the upper part of which forms the stopper of the funnel, whilst the lower part forms the tap of the stopcock. The tap has an opening corresponding with the one in the outer casing so that communication may be established at will. There is also a communication between an opening in the neck of the funnel and a channel in the tube which admits the outer air when the funnel is being used. The liquid is introduced through a special opening fitted with a stopper.

Illustrations are given of two kinds of separating funnels which do not greatly differ from each other. The advantage of these funnels is the prevention of loss of liquid by evaporation or leakage through the stopcock.

L. DE K.

Inorganic Chemistry.

Volume of Hydrogen Evolved by the Action of Acids on Granite. A Correction. By ARMAND GAUTIER (*Compt. rend.*, 1900, 131, 1276. Compare Abstr., 1901, ii, 14).—The author corrects his previous statement that 915 c.c. of hydrogen are evolved from 1 kilogram of granite on treatment with acids. The actual volume evolved is much less than this. The higher value was obtained with granite which contained some metallic iron which had been introduced during the pulverisation of the mineral. H. R. LE S.

Molecular Constitution of Water. By WILLIAM SUTHERLAND (*Phil. Mag.*, [v], 50, 460—489).—Assuming the correctness of Mendel-*é*ef's expansion formula $d_t = d_0(1 - at)$, the density curve is a straight line; the density curve for water, however, has a maximum at 4°, but at high temperatures appears to be asymptotic to the straight line for which $a = 0.001$. It is hence considered that this line represents the expansion of one of the ingredients of water, which it is found by extrapolation has at 0° a density = 1.083. Ice probably consists of the other pure constituent, and from analogy with the increase of volume of other solids on fusion, the author calculates that this, when liquid, should have a density of about 0.88. Water at 0° is a mixture of these two, and, assuming no shrinkage occurs, the proportion of the lighter constituent is 0.375. These two constituents are regarded as $(H_2O)_2$ 'dihydrol,' and $(H_2O)_3$ 'trihydrol,' and, by the aid of empirical formulæ, the quantities of 'dihydrol' in water at temperatures from 0° to 200° are deduced. It is shown that these values reproduce fairly satisfactorily the variation of the index of refraction of water with temperature, the values for $(\mu^2 - 1)/(\mu^2 + 2)a$ being 0.20968 for 'trihydrol' and 0.20434 for 'dihydrol.' The compressibility of water and the dissociation of 'trihydrol' into 'dihydrol' by pressure are considered. From the values deduced for the dissociation, it appears that, at about 2300 atmospheres pressure, the 'trihydrol' would be completely dissociated at 0°; this is in accord with the observed fact that at pressures below 3000 atmospheres the anomalies in the expansion curve of water disappear. The surface tension in thin films is, however, sufficient to convert almost the whole of the 'dihydrol' into 'trihydrol' for temperatures below about 60°, and the exceptional properties of solutions in regard to surface tension are probably due to this difference in constitution between the film and the body of water. The latent heat of fusion of ice is largely the heat of dissociation of 'trihydrol' and the high specific heat of water is also due to this factor. Steam consists solely of H_2O , 'hydrol,' and the latent heat of evaporation hence includes the heat of dissociation of 'dihydrol.' The author calculates the thermal values of these dissociation changes, the values obtained being represented by the equations $2H_2O = (H_2O)_2 + 189 \times 2 \times 18$ cal.; and $3(H_2O)_2 = 2(H_2O)_3 + 177 \times 6 \times 18$ cal. The decrease of viscosity of water with pressure is ascribable to the lower viscosity of 'dihydrol,' whilst the anomalous viscosity of many solutions is due to the effect of the solute in increasing the dissociation of 'trihydrol.' These various molecular states

of water are considered from the point of view of the quadrivalency of oxygen and the actual molecular constitutions are discussed. A summary of the various physical constants for 'dihydrol' and 'trihydrol' is given at the end of the paper.

L. M. J.

Apparatus for the Evolution of Dry Hydrogen Chloride. By A. GWIGNER (*Zeit. angew. Chem.*, 1900, 1308—1309).—The apparatus consists of a 10 cm. wide cylindrical generating vessel, the bottom of which is drawn out to a tube 15 mm. wide and 12 cm. long; this cylinder fits by a ground joint into a waste acid vessel, to the bottom of which is sealed a 25 mm. wide beaker, into which the tube passes to a depth of 10 cm. The waste acid vessel has a side opening to carry off the excess of hydrogen chloride which is trapped into a wash bottle containing water. The top of the cylinder, which is 7 cm. wide, is fitted with a ground, tubulated bulb through which passes a pear-shaped separating funnel, and also a side tube fitted with a stopcock as an outlet for the gas; the stem of the funnel is drawn out to a tube 2 mm. wide and slightly bent sideways.

The funnel, which holds about 200 c.c., is filled with strong sulphuric acid. The conical part of the generating cylinder is filled with pieces of glass tubing, on which are placed large lumps of ammonium chloride. By allowing the acid to drop on the lumps and turning the funnel round occasionally, hydrogen chloride is evolved and escapes through the side tube at the top, whilst the solution of the ammonium sulphate runs into the beaker and in the waste acid vessel.

L. DE K.

Autoxidation: Supplementary Note. By FRITZ HABER (*Zeit. physikal. Chem.*, 1900, 35, 608—609. Compare *Abstr.*, 1900, ii, 720).—An acknowledgment that the catalytic influence of benzoic acid on the action of hydrogen peroxide had already been noticed by Engler and Weissberg (*Abstr.*, 1900, i, 399). Schönbein's example of oxidation, $\text{Pb} + \text{O}_2 + \text{H}_2\text{SO}_4 = \text{PbSO}_4 + \text{H}_2\text{O}_2$, is resolved by the author into $\text{Pb} + \text{O}_2 + 2\text{H}^+ = \text{Pb}^{++} + \text{H}_2\text{O}_2$, by an application of the ionic theory to his fundamental conception, the latter being interpreted by the equation: $\text{M} + \text{O}_2 + \text{H}_2\text{O} = \text{MO} + \text{H}_2\text{O}_2$.

J. C. P.

The Rendering Active ("Activierung") of Oxygen. By WILHELM MANCHOT (*Annalen*, 1900, 314, 177—199. Compare Manchot and Herzog, *Abstr.*, 1900, ii, 546).—With the object of throwing light on the rendering active of oxygen, the author has studied the oxidation of certain phenols in air. The hydroxy-derivatives of the higher hydrocarbons, which are easily converted into stable products, can be studied with ease, and it is found that hydrogen peroxide is always present at the close of the operation. In the case of the hydroxy-benzenes, a more complicated series of actions takes place. Alkaline quinol, for instance, is converted into quinone and quinhydrone, all three substances absorbing oxygen and producing hydrogen peroxide, which can then act on the materials mentioned. The investigation has been extended to hydrazobenzene, hydrazotriazole, and hydrazomethyltriazole, which, when agitated with barium hydroxide in air, give rise to barium peroxide.

For experimental details and the author's theoretical considerations, reference must be made to the original paper. M. O. F.

Action of Hydrogen Peroxide on Thiosulphates. By ARNOLD NABL (*Ber.*, 1901, 33, 3554—3555).—The author withdraws his previous statement as to this action (compare this vol., ii, 16). The alkaline reaction developed on adding hydrogen peroxide to a solution of sodium thiosulphate, is due to liberation of sodium hydroxide in accordance with the equation $2\text{Na}_2\text{S}_2\text{O}_3 + \text{H}_2\text{O}_2 = \text{Na}_2\text{S}_4\text{O}_6 + 2\text{NaOH}$, and the green fluorescence in the liquid is probably due to a compound of the litmus with barium tetrathionate. A. L.

Refractive Power of Tellurium in its Compounds. By G. PELLINI and ALFREDO MENIN (*Gazzetta*, 1900, 30, ii, 465—475).—The refractive powers of the following compounds have been measured for the line H_α : (1) tellurium tetrachloride (in benzene); (2) tellurium tetrabromide (in ether); (3) potassium tellurite (in water); (4) telluric acid (in water); and (5) telluriumdiphenyl. Calculation of the atomic refraction of tellurium from these results gives the following mean numbers. According to the Gladstone formula: (1) 32.53, (2) 33.82, (3) 26.10, (4) 24.65, (5) 32.07; for the Lorenz-Lorentz formula: (1) 15.28, (2) 16.66, (3) 17.25, (4) 14.08, (5) 15.52. Thus, for the Gladstone formula, the atomic refraction of tellurium is less in the oxygenated compounds than in the organic and haloid derivatives, a relation which holds also for sulphur and selenium. The difference between the specific refractions of telluric and sulphuric acids (15.57) is almost identical with the difference between those of telluriumdiphenyl and sulphurdiphenyl (15.01). The dispersion of telluriumdiphenyl is high, as is shown by the following numbers: $(\mu_{\text{H}\beta} - \mu_{\text{H}\alpha})/d = 0.02226$ and $(\mu_{\text{H}\beta}^2 - 1)/(\mu_{\text{H}\alpha}^2 - 1) = 1.0778$. T. H. P.

Hydrogen Telluride. By EDMUND ERNYEI (*Zeit. anorg. Chem.*, 1900, 25, 313—317).—Hydrogen telluride mixed with 5—6 per cent. of hydrogen is obtained when tellurium as the negative pole is subjected to a current of 220 volts in an electrolyte of 50 per cent. sulphuric acid. It is essential that the electrolyte should be cooled to -15° or -20° , that organic substances and air should be excluded, and that the mixed gases should be dried at once with calcium chloride and phosphoric oxide. The hydrogen telluride separates in lemon-yellow needles melting at -54° when the mixture of gases is cooled with solid carbon dioxide. It is a colourless, poisonous gas, decomposes immediately in contact with air, or even in a sealed tube, and in two days when kept in a mixture of ice and salt. It burns with a bright blue flame, is somewhat soluble in water, and with potassium and sodium hydroxides yields colourless tellurides which become red and decompose on exposure to the air. It reduces ferric to ferrous chloride and mercuric to mercurous chloride, and decolorises iodine and bromine solutions. The vapour density, determined by Dumas' method, was found to be 65.1 ($\text{H}=1$) or 4.49 ($\text{air}=1$) agreeing with the formula TeH_2 . E. C. R.

Combustion of Nitrogen. By ROBERTO SALVADORI (*Gazzetta*, 1900, 30, ii, 389—404).—In order to obtain the non-absorbable

portion of gas emanating from the earth, the author burns the gas in oxygen in a special apparatus which admits of the products of combustion being absorbed and the residue collected. The combustion takes place in the bulb of an inverted retort, into which the gas is led by a tube which is surrounded by a wider tube for the admission of the oxygen; the products of combustion pass along the neck of the retort into an adapter and thence into the absorbing bulbs, &c. By this means, the whole of the combustible portion of the gas is readily removed, but it is found that when a large excess of oxygen is used, a part of the nitrogen also undergoes combustion. With the same apparatus, a series of experiments has been carried out on the combustion of hydrogen in various mixtures of nitrogen and oxygen, with special reference to the amount of nitrogen consumed and the quantities of ammonia and of nitrous and nitric acids produced. One of the experiments, chosen at random from the table given, had the following results: between 60 and 70 litres of hydrogen were burnt in 80 litres of a mixture containing 67·64 per cent. of oxygen and 32·36 per cent. of nitrogen, the total nitrogen transformed being 254·58 c.c. or 0·3182 gram. As the proportion of nitrogen to oxygen in the mixture is gradually increased, the quantity of nitrogen undergoing combustion rises to a maximum and then falls. Previous heating of the gases does not seem to have an appreciable effect on the proportion of nitrogen attacked, which is, however, increased by increasing the capacity of the combustion chamber. Using for the latter a flask of about 18 litres capacity, kept cool by means of water flowing over it and passing also a current of steam into the flask, 40 litres of hydrogen when burnt in 50 litres of a mixture containing 60 per cent. of oxygen and 40 per cent. of nitrogen, gave a yield of 456·12 c.c. of nitrogen entered into combination; this represents the greatest amount of transformation obtained in the author's experiments. Berthelot's experiments (Abstr., 1899, ii, 648; 1900, ii, 475, 476, 538) are referred to.

T. H. P.

Action of Alkali Hydroxides and Alkaline Earths on Arsenic Pentasulphide. By LE ROY W. McCAY (*Zeit. anorg. Chem.*, 1900, 25, 459—467).—The author has repeated his work on the preparation of thioxyarsenic acids (Abstr., 1899, ii, 745) in consequence of a statement by Weinland and Lehmann (*Chem. Zeit.*, 1889, 23, 865) that monothioxyarsenates are not formed. The results confirm those previously obtained, namely, that when arsenic pentasulphide is dissolved in warm solutions of an alkali hydroxide, ammonia or calcium, strontium or barium hydroxides, monothioxyarsenates and dithioxyarsenates are formed, of which the monothioxyarsenate predominates.

E. C. R.

Density of Carbon Dioxide in the Solid and Liquid State. By U. BEHN (*Ann. Phys.*, 1900, [iv], 3, 733—743).—By means of suspension in ether, the density of solid carbon dioxide at -79° and under the pressure of 1 atmosphere is found to be 1·53. The density of the liquid under the pressure of its saturated vapour between $+25^{\circ}$ and -57° has been determined by a float method, allowance being made

for the contraction of the float at the high pressures. The following are the values obtained :

Temperature.	Density.	Temperature.	Density.
24.3°	0.7202	- 14.7°	1.0051
22.4	0.7395	- 26.9	1.0626
19.7	0.7740	- 37.4	1.1054
16.4	0.8061	- 48.6	1.1503
9.3	0.8661	- 57.5	1.1809
0.1	0.9255		

The results obtained agree well with those of Amagat (Abstr., 1892, 934), so far as the range of temperature is the same. J. C. P.

Electrolytic Preparation of Alkali Metals from fused Alkali Chlorides. By ARTHUR FISCHER. (*Zeit. Elektrochem.*, 1900, 7, 349—354).—The author's experiments were made with a mixture of potassium and sodium chlorides in molecular proportion, from which sodium containing about 1 per cent. of potassium is obtained by electrolysis. The anode was of carbon, the cathode of iron, and the cathodic current density 5 to 10 amperes per sq. cm., the salt being fused by the current itself. The chief source of loss of sodium was found in the circulation set up in the liquid by the evolution of chlorine at the anode. The flow of liquid thus produced carries globules of metal away from the cathode towards the anode, where it recombines with chlorine. After many unsuccessful attempts, this source of loss was almost entirely eliminated by interposing a partition, dipping a little below the surface of the bath, between the electrodes. The partition consisted of a water-cooled iron tube of rectangular section covered externally by plates of marble.

T. E.

Solubility of Alkali Chlorides and Chlorates. By F. WINTERLER (*Zeit. Elektrochem.*, 1900, 7, 360—362).—Tables are given of the solubility of (1) potassium chloride in solutions of potassium hydroxide, (2) sodium chloride in solutions of sodium hydroxide, (3) sodium chlorate in solutions of sodium chloride, and (4) potassium chlorate in solutions of potassium chloride, all at 20°. The specific gravities of the solutions are also included.

T. E.

Properties of Sodium Peroxide. By GEORGE F. JAUBERT (*Compt. rend.*, 1901, 132, 35—36).—Sodium peroxide prepared by the action of oxygen on the metal is yellow and not white, and the colour deepens on heating. It becomes very dark when heated to a high temperature in contact with silver, but the metal is attacked. Commercial samples of the peroxide which are white owe the absence of colour to the presence of a considerable proportion of the hydroxide and carbonate. Contrary to the usual statements, pure sodium peroxide does not deliquesce even after prolonged exposure to the air; it changes from yellow to white owing to its conversion into carbonate. If, however, the peroxide is exposed to air freed from carbon dioxide, the results are different and will be described subsequently.

C. H. B

Combination of Silver and Oxygen. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1900, 131, 1159—1167).—Pure silver foil, when heated at 500—550° in sealed tubes containing dry oxygen, is disintegrated and partly converted into a yellowish-white powder giving the reactions of argentous oxide, Ag_2O , which seems to consist of a mixture of this compound with the finely divided metal. Comparable experiments made with dry air gave similar results. When moist oxygen or air is employed, the disintegration of the metal is more pronounced and the absorption of gas is greater. There is an appreciable action at 200°, but no alteration of the metal is observed at 100°. No disintegration occurs when the metal is heated at 550° with nitrogen, steam, or carbon dioxide. G. T. M.

Carbon Monoxide and Silver. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1900, 131, 1167—1169. Compare preceding abstract).—Pure silver foil, when heated for 4 hours at 500° in a sealed tube containing dry carbon monoxide, is found to have withdrawn a considerable amount of carbon from this oxide, whilst an analysis of the gaseous residue indicates a diminution in the volume of gas and a production of 3.6 per cent. of carbon dioxide. This reaction begins even at 300°, but at this temperature its progress is very slow. Carbon monoxide, when heated at temperatures not exceeding 550°, yields carbon dioxide without depositing carbon; it is therefore probable that the deposition of carbon in the foregoing experiment results from the decomposition of a silver carbonyl compound analogous to the corresponding iron derivative. G. T. M.

Hydrogen and Silver. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1900, 131, 1169—1170. Compare preceding abstracts).—Silver, when heated for 5 hours at 500—550° in sealed tubes containing hydrogen, shows signs of disintegration, which are, however, less pronounced than when produced by heating the metal in oxygen or carbon monoxide. The metal is permeable by gases at a red heat, for on heating a silver crucible containing sodium hydrogen carbonate over a gas flame at a temperature below the fusing point of sodium carbonate, it is found that, after 20 to 30 operations, the crucible has become charged with sodium and is very brittle. The presence of the alkali metal in the substance of the crucible is due to the reduction of the carbonate by the gases, particularly hydrogen and carbon monoxide, arising from the gas flame. G. T. M.

Calcium Amalgam. By JOHANN SCHÜRGER (*Zeit. anorg. Chem.*, 1900, 25, 425—429).—Calcium amalgam, CaHg_5 , obtained by heating a mixture of calcium with mercury in an atmosphere of carbon dioxide at 200—220°, crystallises in rhombic prisms or needles. It is a reducing agent, is unaltered at the ordinary temperature by dry hydrogen, nitrogen, or nitrous oxide, and oxidises slowly in dry air but very quickly in moist air. When heated with dry ammonia at the boiling point of mercury, it is converted into a mixture of calcium hydride and nitride, which decomposes violently in contact with water, with evolution of hydrogen and ammonia. When heated with nitrous oxide, it is converted into calcium oxide without the formation of nitride or

nitrosyl calcium. When heated with phosphine, it yields calcium phosphide and a yellow sublimate of mercury phosphide.

E. C. R.

Calcium Carbide and Silicon Carbide as Reducing Agents for Metallic Oxides, Salts, and Ores. By B. NEUMANN (*Chem. Zeit.*, 1900, 24, 1013—1014).—Chlorides are most easily reduced by calcium carbide; they must be quite dry, and are mixed with oxide, so that the reaction is $M_2O + 2MCl + CaC_2 = 6M + CaCl_2 + 2CO$ [$M =$ a metal]. Sodium chloride, or, better, a mixture of sodium and potassium chlorides, may be added as a flux. Copper, lead, and nickel can be obtained in a button; some metals remain in small scattered globules, and others volatilise to a large extent.

Sulphates, mixed with oxides, can be reduced according to the equation $M_2SO_4 + 2M_2O + CaC_2 = 6M + CaSO_4 + 2CO$; in the absence of oxide, a sulphide is formed. Carbonates are reduced according to the equation $M_2CO_3 + 2M_2O + CaC_2 = 6M + CaCO_3 + 2CO$. Oxides and roasted ores can be reduced in many cases, not in others; the reaction is $3M_2O + CaC_2 = CaO + 6M + 2CO$.

The reduction was effected in a clay crucible, which was heated in a gas furnace. The method is too expensive to find general application on the manufacturing scale; in the case of the rarer metals, where its cost is of less importance, the aluminium method is preferable, as it is neater, and requires no external heat.

Carborundum (silicon carbide) also reduces metallic oxides; sodium carbonate must be added as a flux.

C. F. B.

Reduction by means of Calcium Carbide. By FR. VON KÜGELGEN (*Chem. Zeit.*, 1900, 24, 1060—1061. Compare Neumann, preceding abstract).—When calcium carbide is heated with a chloride in the absence of an oxide, the reaction is $2MCl + CaC_2 = 2M + CaCl_2 + 2C$, and the reduced metal does not fuse to a single button. A mixture of chloride and oxide, or an oxide alone, is not reduced according to the equations given by Neumann; the reactions are really $4M_2O + 2MCl + CaC_2 = 10M + CaCl_2 + 2CO_2$; $5M_2O + CaC_2 = CaO + 10M + 2CO_2$, the gas evolved being almost entirely carbon dioxide.

C. F. B.

Electrolysis of Calcium Chloride with Reference to the Formation of Chlorate. By SAMUEL A. TUCKER and HERBERT R. MOODY (*J. Soc. Chem. Ind.*, 1900, 19, 977—981).—The electrolysis of aqueous calcium chloride gives rise to a mixture of calcium chlorate and hypochlorite in proportions depending on the conditions; details are given of a large number of experiments made to determine the conditions most favourable to the formation of chlorate, with a view to utilising practically the waste calcium chloride of the ammonia soda process. The best concentration appears to be approximately 20 per cent., with horizontal platinum electrodes separated by 10 cm.; platinum is the only metal capable of withstanding the action. The electrodes should be of the same size, with a current density of 8 amperes per sq. decimetre; the best temperature is 80°. The

addition of sodium dichromate or hydroxide is advantageous under certain specified conditions. After the electrolysis has proceeded for about 14 hours, there is an appreciable drop in the efficiency, but this is not so great as to seriously interfere with the working value of the process, the efficiency after the 49th hour being about 76 per cent.

W. A. D.

Radioactive Substances. By FRITZ GIESEL (*Ber.*, 1900, 33, 3569—3671. Compare this vol., ii, 19).—The mother liquor from the recrystallisation of 2 kilos. of radium-barium chloride, after removing the greater portion of the lead and practically the whole of the radium, yields a precipitate with ammonia which is strongly radioactive, the activity of the insoluble oxalates of the rare earths subsequently obtained from the filtrate being quite small in comparison. The active precipitate, when dissolved in hydrochloric acid and subjected to the action of hydrogen sulphide, furnishes a sulphide which is yellow at first and then turns brown, the total product weighing 3 mg. and being as strongly radio-active as highly concentrated radium preparations. The rays emitted by the sulphide resemble those of polonium, readily undergoing absorption, and behaving similarly in the magnetic field. After one month, the preparation showed no diminution in radio-activity; it does not contain bismuth, but yields an insoluble sulphate, probably the lead salt, which is, however, far less active than the product subsequently obtained by precipitation with ammonia; the residue left on evaporating the final filtrate is also decidedly active. The radio-activity of these active fractions does not equal that of the original sulphide.

Röntgen rays and those emitted by radium are similar in their physiological action. About 0.2 gram of radium-barium chloride contained in a celluloid capsule, and applied for 2 hours to the inner side of the arm, produced a slight irritation which after 3 weeks developed into acute inflammation followed by desquamation and recovery of the affected part. The leaves of plants, when submitted to the rays, lose their chlorophyll and fade; paper when similarly treated becomes brown and friable.

G. T. M.

Plumbic Sulphate. By KARL ELBS and F. FISCHER (*Zeit. Elektrochem.*, 1900, 7, 343—347).—Plumbic sulphate is formed by electrolysis of sulphuric acid of sp. gr. 1.7 to 1.8 at temperatures not exceeding 30° with a current density at the anode of 0.02 to 0.06 amperes per sq. cm. The anode is of lead and should be immersed in a considerable volume of acid and separated from the cathode by a porous pot. The salt is partially deposited during the electrolysis in the form of a mud containing 60 to 85 per cent. of plumbic sulphate; a purer salt is afterwards deposited in indistinct crystals from the anode liquid.

Plumbic sulphate has a faint greenish-yellow shade, 100 c.c. of concentrated sulphuric acid dissolve about 0.345 gram of it at 30°; it reacts with or is insoluble in all ordinary solvents. Water decomposes it at once into sulphuric acid and lead peroxide. Sulphuric acid of sp. gr. less than 1.65 produces the same change more

or less quickly at the ordinary temperature. Concentrated hydrochloric and acetic acids dissolve it, forming lead tetrachloride and tetracetate. As an oxidising agent, it resembles but is more energetic than lead peroxide. With cold concentrated sodium hydroxide solution, a plumbate is formed.

Plumbic sulphate forms double salts with the sulphates of the alkali metals, ammonia, and the amines such as $K_2Pb(SO_4)_3$ and $(NH_4)_2Pb(SO_4)_3$. These are more stable than the single salt. They may be prepared by adding the finely powdered alkali sulphates to the solution of plumbic sulphate in concentrated sulphuric acid or by electrolysis (with lead anode) of sulphuric acid to which these salts have been added.

The ammonium and potassium salts are yellow, indistinctly crystalline powders, almost insoluble in sulphuric acid of sp. gr. 1.7; toward reagents, they behave like plumbic sulphate.

The formation of plumbic sulphate explains the rapid disintegration of the positive plates of accumulators when charged with too high currents.
T. E.

Thallium Bromochlorides. By VICTOR THOMAS (*Compt. rend.*, 1900, 131, 1208—1211. Compare this vol., ii, 60).—The orange powder, obtained by adding to thallous chloride suspended in water sufficient bromine to convert it into a compound of the type Tl_2X_3 , dissolves in boiling water and its solution on cooling to 24° deposits a *bromochloride*, $Tl_4Cl_3Br_3$, crystallising in orange, hexagonal plates. A deposit of orange needles grouped in fern-like aggregates is produced on concentrating the solution but it is invariably contaminated with crystals of the preceding compound. The mother liquors on evaporation yield first a second crop of hexagonal plates and then a second crop of acicular crystals. These products all contain less bromine than the compound obtained in the first crystallisation.
G. T. M.

Polysulphides of Copper. By ADELBERT RÖSSING (*Zeit. anorg. Chem.*, 1900, 25, 407—414).—*Copper hexasulphide*, Cu_2S_6 , is formed in very small quantity when copper salts are precipitated with yellow sodium sulphide solutions. It is easily prepared by fusing a mixture of anhydrous copper sulphate, sodium carbonate, and sulphur, dissolving the fused mass in cold water in an atmosphere of hydrogen, and precipitating the clear solution with hydrochloric acid; the orange-red precipitate is dried over sulphuric acid and extracted with carbon disulphide. All operations must be conducted at a low temperature and with the least possible exposure to the air. Copper hexasulphide dissolves in solutions of alkali or barium polysulphides, is decomposed into copper sulphide by colourless alkali sulphides, and is converted into the dark blue *sulphide*, Cu_4S_5 , when shaken with concentrated ammonia. The *trisulphide*, Cu_2S_3 , obtained by treating the hexasulphide in a reflux apparatus with boiling ether or carbon disulphide, is a dark brown, amorphous powder, more stable than the hexasulphide, and is converted into cupric sulphide when boiled with alcohol.
E. C. R.

Copper Selenides. By HENRI FONZES-DIACON (*Compt. rend.*, 1900, 131, 1206—1208).—Cupric selenide, $CuSe$, formerly prepared

by Berzelius, is obtained in bluish-black, prismatic needles by heating cupric chloride at 200° in a stream of hydrogen selenide; at higher temperatures, the product fuses and begins to decompose. Cuprous selenide, Cu_2Se , is produced as an olive-green precipitate by the action of hydrogen selenide on a hydrochloric acid solution of cuprous chloride. This substance is obtained in lustrous octahedra and tetrahedra either by passing hydrogen selenide over the heated chlorides of copper or by reducing cupric selenide at a red heat in a current of hydrogen. Copper selenite, when reduced by hydrogen at high temperatures, yields only metallic copper, but crystals of cuprous selenide are produced when the salt is heated with carbon.

The selenides are decomposed by hydrogen chloride either in solution or at high temperatures, in the former case, hydrogen selenide being evolved; they are readily attacked by chlorine, oxidised to cupric selenite by nitric acid and dissolved by sulphuric acid with the evolution of sulphur dioxide. Ammonia attacks the cuprous selenide rather more readily than the cupric compound, whilst both substances are partially soluble in ammonium hydrosulphide. G. T. M.

Alleged Volatility of Mercurous Chloride at 37° . Reduction of Mercurous Compounds by Animal Tissues. By MARCO SOAVE (*Chem. Centr.*, 1900, ii, 1147—1148; from *Giorn. Farm. Chim.*, 1900, 50, 433—439).—The author has been unable to confirm Piccardi's observation that when powdered calomel, calomel ointment, or calomel suspended in water is heated at 37° , mercury vapour is evolved. Mercurous chloride and other mercurous compounds are decomposed, however, by the action of the gastric juice, intestinal fluids, the liver, kidneys, or blood, muscular tissue or proteids, with formation of mercury vapour. E. W. W.

Solubility of Mercury Haloid Salts, and especially of Mercuric Iodide, in Organic Solvents. By OTTOKAR ŠULC (*Zeit. anorg. Chem.*, 1900, 25, 399—404).—The solubilities of mercuric chloride, bromide, and cyanide and of mercurous chloride at 18 — 20° in chloroform, tetrachloromethane, bromoform, ethyl bromide, and ethylene dibromide are given, as are those of mercuric iodide in chloroform, tetrachloromethane, ethylene dichloride, *isobutyl* chloride, ethyl bromide, methyl, ethyl, *isopropyl* or *isobutyl* alcohol, methyl or ethyl formate, methyl or ethyl acetate, ether, acetone, acetal, chloral, epichlorhydrin, hexane, and benzene. Of these solvents for the iodide, methyl alcohol (6.512 in 100) is the best and hexane (0.072 in 100) the worst. The solutions of the iodide are yellow except in the case of ethyl bromide; the crystals which separate from them are either yellow or red, and all become red on standing (Kastle and Clark, *Abstr.*, 1900, ii, 141). The red colour of the solutions in ethyl bromide and bromoform is due to the liberation of iodine, which does not take place in the dark. Lead iodide is slightly decomposed in a similar manner when dissolved in ethyl bromide.

E. C. R.

Double Compounds of Mercuric and Potassium Iodides. By WLADIMIR PAWLOFF (*J. Russ. Phys. Chem. Soc.*, 1900, 32, 732—741).—A solution of mercuric iodide in aqueous potassium iodide

containing the salts in molecular proportion deposits hygroscopic, acicular crystals of the composition $\text{HgI}_2 \cdot \text{KI} \cdot \text{H}_2\text{O}$, which are soluble in alcohol without change, but are decomposed by water. The crystals melt at about 105° , and at 116.5° are completely decomposed with formation of a deep red liquid which boils at $191\text{--}193^\circ$.

If the two salts are present in the aqueous solution in the ratio $\text{HgI}_2 : 2\text{KI}$, the crystals obtained have the composition $\text{HgI}_2 \cdot 2\text{KI} \cdot 2\text{H}_2\text{O}$; at high temperatures, these decompose into potassium iodide and the double salt, $\text{HgI}_2 \cdot \text{KI}$.

T. H. P.

Cerium. By G. P. DROSSBACH (*Ber.*, 1900, 33, 3506—3508).—Commercial cerium carbonate was partially purified and then converted into the double nitrate, $\text{Ce}_2(\text{NO}_3)_6 \cdot 3\text{NH}_4\text{NO}_3 \cdot 10\text{H}_2\text{O}$; this salt was fractionally crystallised some 200 times, but all fractions appear to be identical in every respect with the preparations obtained by older methods. The dioxide which is formed on ignition always has a pale yellow colour.

The double nitrate and also the compound $\text{Ce}_2(\text{NO}_3)_6 \cdot x\text{NH}_4\text{NO}_3 + \text{aq}$ are only slightly hygroscopic; they crystallise well, and any didymium salts are left in the mother liquors. Salts of lanthanum and the ytterite earths are somewhat more difficult to remove, but, after three crystallisations can be proved to be absent.

All metals of the cerium and yttrium groups dissolve readily in alkali carbonate solutions.

J. J. S.

Spectra of Samarium and Gadolinium. By EUGÈNE DEMARÇAY (*Compt. rend.*, 1900, 131, 995—998).—The spectra of samarium and gadolinium previously described by the author (*Abstr.*, 1900, 597, 656) differ considerably from those described by Exner (*Sitz. Acad. Wiss. Wien*, 1900, 19), and although the actual measurements of the latter are probably more accurate, yet many of the lines are wrongly identified. This is due to the fact that the specimens were impure, and Exner attributed to samarium all lines which were strong in the samarium spectrum and weak in the gadolinium, and *vice versa*. This negative evidence leads to errors; to obtain more certain results, the author has repeatedly purified his specimens, and observed the variation of the lines with each increase of purity, only those being attributed to samarium which remain of constant intensity; the wave-lengths of these with their relative intensities are given.

L. M. J.

Position of Indium in the Classification of the Elements. By CAMILLE CHABRIÉ and ÉTIENNE RENGADÉ (*Compt. rend.*, 1900, 131, 1300—1303. Compare *Abstr.*, 1873, 846).—*Cesium indium sulphate*, $\text{Cs}_2\text{SO}_4 \cdot \text{In}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$, was prepared by mixing hot concentrated solutions of the sulphates of the two metals, and on cooling separated in crystals belonging to the cubic system. One hundred parts of water at 16.5° dissolve 3.04 grams of the salt. Its aqueous solutions are acid to litmus and deposit a precipitate on heating. *Rubidium indium sulphate*, $\text{Rb}_2\text{SO}_4 \cdot \text{In}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$, was prepared in a similar manner and crystallises in transparent octahedra. The existence of these two double sulphates of indium and also of its corresponding ammonium compound, and the fact that its hydroxide is soluble in

alkalis, point to indium being more allied in properties to aluminium than to iron.

Indiumacetylacetone, $\text{In}_2(\text{CHAc}_2)_6$, prepared by the action of acetylacetone on indium oxide, crystallises in flat, hexagonal prisms, melts at 183° , and sublimes and decomposes at $260\text{--}280^\circ$; it is insoluble in boiling water or cold alcohol, but dissolves readily in boiling alcohol.

H. R. LE S.

Hexahydrate of the Double Iodide of Manganese and Mercury. By D. DOBROSERDOFF (*J. Russ. Phys. Chem. Soc.*, 1900, 32, 742—744).—A saturated solution of mercuric iodide in saturated aqueous manganous iodide deposits yellowish, prismatic crystals of the composition $\text{MnI}_2 \cdot 2\text{HgI}_2 \cdot 6\text{H}_2\text{O}$, which when heated melt in their water of crystallisation and at higher temperatures decompose completely, leaving a residue of trimanganic tetroxide.

T. H. P.

Soluble Alkali Salts of Ferric Oxide and of Ferric Acid. By FRITZ HABER [and in part WALDEMAR PICK] (*Zeit. Elektrochem.*, 1900, 7, 215—221).—Poggendorf has stated that an anode of cast iron, in a concentrated solution of potassium hydroxide is oxidised to sodium ferrate; with other kinds of iron, this is not the case. The authors find that, immediately after closing the electric circuit, all varieties of iron are oxidised to ferrate and that the action is continuous provided that the solution of alkali hydroxide is concentrated and the current density low (about 0.001 ampere per sq. cm.). Under similar conditions, the yield of ferrate is greatest with cast iron and smallest with wrought iron; it is also greater with sodium than with potassium hydroxide, probably on account of the greater solubility of sodium ferrate. The quantity of ferrate reduced at the cathode (a platinum wire) in a cell without a diaphragm is comparatively trifling. The yield of ferrate depends on the temperature; under the same conditions, traces only of ferrate were formed at 0° , whilst at 70° the current efficiency was almost 100 per cent.

When the ferrate solution is boiled for a sufficiently long time, it becomes colourless or pale yellow, provided that care has been taken to use materials which are free from manganese. The yellowish solution contains a soluble ferrite and when kept deposits colourless crystals of a compound which very quickly decomposes when it is removed from the strongly alkaline liquid. The same solution of ferric oxide is obtained by boiling ferric hydroxide with a concentrated solution of sodium hydroxide. Addition of an alkaline sulphide gives a red coloration, due to the formation of the double alkali iron sulphide to which the "red liquors" of the Leblanc alkali manufacture owe their colour.

When pure iron is boiled gently for a few minutes with concentrated sodium hydroxide solution, the liquid is found to contain ferrous oxide. When exposed to air, this solution readily oxidises, to the ferric oxide solution. Both the solutions of ferrous and ferric oxide are readily oxidised to ferrate by electrolytic oxygen.

T. E.

Crystalline Form of Luteocobaltic Chlorosulphate and Chloroselenate. By TIMOTHÉE KLOBE (*Compt. rend.*, 1900, 131, 1305—1308).—Luteocobaltic chlorosulphate, $\text{Co}(\text{NH}_3)_6\text{SO}_4\text{Cl} \cdot 3\text{H}_2\text{O}$,

crystallises in prisms belonging to the rhombic system; they are isomorphous with the crystals of luteocobaltic selenate,



Full crystallographic measurements of the crystals of both salts are given in the paper. H. R. LE S.

Solubility of Some Salts in Water. By RUDOLF DIETZ, ROBERT FUNK, J. VON WROCHEM, and FRANZ MYLIUS (*Wiss. Abhandl. phys.-tech. Reichsanstalt*, 1900, 3, 425—477, and in part *Ber.*, 1901, 33, 3686—3696).—The greater part of this work has already been published (see Mylius and Funk, *Abstr.*, 1897, ii, 316, 442; Dietz, *Abstr.*, 1899, ii, 221; Funk, *Abstr.*, 1899, ii, 209). The paper, however, describes also an investigation of sodium and calcium chromates.

Normal sodium chromate, Na_2CrO_4 , exists as decahydrate, tetrahydrate, and anhydrous salt, each form having its own characteristic solubility; whilst the solubility of the decahydrate increases rapidly with rising temperature, that of the anhydrous salt increases only very slightly, a behaviour analogous to that of the isomorphous sodium sulphate. The dichromate, $\text{Na}_2\text{Cr}_2\text{O}_7\cdot 2\text{H}_2\text{O}$ is stable up to 83° , at which temperature it changes into the anhydrous salt. The existence of sodium trichromate, $\text{Na}_2\text{Cr}_3\text{O}_{10}$ (compare Stanley, *Abstr.*, 1887, 110), is confirmed, but the authors show that it crystallises with $1\text{H}_2\text{O}$; the saturated solution at 0° contains 80 per cent. of the salt. Sodium tetrachromate, $\text{Na}_2\text{Cr}_4\text{O}_{13}\cdot 4\text{H}_2\text{O}$, has been prepared; it is stable in aqueous solution up to 40° , about which temperature it decomposes into chromium trioxide and trichromate.

When a saturated sodium hydroxide solution is added to a concentrated solution of normal sodium chromate, rhombohedral, yellow crystals separate of the composition $\text{Na}_4\text{CrO}_5\cdot 13\text{H}_2\text{O}$ —tetrasodium chromate; these crystals are very deliquescent, take up carbon dioxide from the air, and melt about 50° ; they cannot be obtained below 0° .

The solubility has been determined, and the conditions of existence studied, of five different modifications of calcium chromate; these are (1) monoclinic dihydrate, $\text{CaCrO}_4\cdot 2\text{H}_2\text{O}$, (2) rhombic dihydrate, (3) monohydrate, $\text{CaCrO}_4\cdot \text{H}_2\text{O}$, (4) hemihydrate, $\text{CaCrO}_4\cdot \frac{1}{2}\text{H}_2\text{O}$, (5) anhydrous salt. A crystallographic investigation of the first two modifications is added. The monohydrate is characterised by the fact that its solubility falls rapidly with rising temperature, the saturated solution containing 11.5 per cent. of the salt at 0° , and 3.1 per cent. at 100° . The above five modifications all exist in solution within a certain range of temperature; thus, at 18° , five distinct saturated solutions of calcium chromate may be obtained. J. C. P.

Uranium Nitrate. By WILLIAM OECHSNER DE CONINCK (*Compt. rend.*, 1900, 131, 1219—1220).—Uranium nitrate is insoluble in petroleum, the aromatic hydrocarbons, carbon disulphide, or glycerol; it dissolves in methyl, ethyl, propyl, isobutyl, or amyl alcohol and also in acetone, ether, ethyl acetate, or formic or acetic acid, but is only sparingly soluble in turpentine.

One part of the salt dried at 85° dissolves in 2 parts of distilled

water at 13—14°; the heat of dissolution of $\text{UO} \cdot \text{NO}_3 \cdot 3\text{H}_2\text{O}$ at 17—18° is 3·8 Cal.

The nitrate dissolves in lime-water, but the solution subsequently yields a yellow, flocculent deposit; it is insoluble in solutions of ammonia or the alkali hydroxides, but is readily soluble in mineral acids, whether dilute or concentrated.

G. T. M.

Uranium Nitrate. By WILLIAM OECHSNER DE CONINCK (*Compt. rend.*, 1900, 131, 1303—1305).—Aqueous solutions of uranium nitrate are slowly decomposed by diffused sunlight; if the solutions are acidified with hydrochloric acid or acetic acid, they become extremely stable. Solutions of uranium nitrate in commercial methyl alcohol or ethyl alcohol are readily decomposed by diffused sunlight, a black uranium oxide being deposited. One part of uranium nitrate, dried at 90°, dissolves in 55 parts of methyl alcohol at 11—12·6°; 30 parts of ethyl alcohol (85°) at 12·9—13°; 65 parts of pure acetone at 11·9—12·2°, and in 5·6 parts of acetic acid of sp. gr. 1·035, at 14—14·5°.

Tables are given of the sp. gr. of solutions of uranium nitrate in commercial methyl alcohol and in acetic acid.

H. R. LE S.

Production of Alloys of Tungsten and of Molybdenum in the Electric Furnace. By CHARLES L. SARGENT (*J. Amer. Chem. Soc.*, 1900, 22, 783—791).—The author has prepared small specimens of alloys of both tungsten and molybdenum with other metals, by heating a suitable mixture of the oxides of the desired metals with sugar carbon in the electric furnace in a carbon crucible, sometimes with a magnesia lining. By operating on 5 to 10 grams of mixture of oxides and carbon with a current of 70 to 90 volts, and 100 to 150 amperes, the operation was finished within 1 to 5 minutes.

Whilst tungsten and bismuth did not yield an alloy, definite results were obtained with molybdenum and bismuth. Copper alloyed with tungsten, but it refused to do so with molybdenum. Both tungsten and molybdenum failed to alloy with tin, and whilst the former failed to combine with manganese, the latter readily united with it. Both metals seemed to alloy with the greatest ease with cobalt, chromium, and nickel; these alloys may, perhaps, prove to be technically important, if readily obtainable in large quantities.

L. DE K.

A New Tungsten Phosphide. By ED. DEFACQZ (*Compt. rend.*, 1901, 132, 32—35).—When tungsten diphosphide is heated with copper in the electric furnace, it is decomposed; but if it is heated with a large excess of copper phosphide in a graphite crucible in a wind furnace and the product treated with dilute nitric acid, a new phosphide, WP, is obtained in grey, lustrous, prismatic crystals of sp. gr. 8·5. This *tungsten monophosphide* burns in air or oxygen at a red heat, and is likewise attacked by chlorine, but it is not decomposed by hydrofluoric or hydrochloric acid, or by hydrogen chloride. It is slowly oxidised by hot nitric acid, and is rapidly dissolved by a mixture of nitric and hydrofluoric acids, or by aqua regia. Sodium and potassium hydroxide solutions have no action on the phosphide, but the fused hydroxides and fused mixtures of alkali carbonates and nitrates readily

oxidised it, whilst fused potassium hydrogen sulphate attacks it slowly.

C. H. B.

Physico-chemical Researches on Tin. III. By ERNST COHEN (*Zeit. physikal. Chem.*, 1900, 35, 588—597. Compare Abstr., 1900, ii, 83, 212, 408).—The change of white tin into grey tin can be observed in filings of the metal, proving the incorrectness of the old view of Lewald, according to which the change took place only in block tin, and was probably due to a strained condition of the crystals. Mechanical vibration is found, so far, to be without influence on the transformation of white into grey tin. The presence of cobalt nitrate affects, not only the velocity of the transformation grey tin \rightleftharpoons white tin, but also the temperature of the maximum velocity. The velocity of the transformation is, further, very dependent on the history of the tin investigated, and consistent results can be obtained only with specimens which have been subject to the same conditions.

J. C. P.

Composition of Thorium Hydride and Nitride. By CAMILLE MATIGNON and MARCEL DELÉPINE (*Compt. rend.*, 1901, 132, 36—38).—The hydride obtained by the action of hydrogen on thorium at a dull red heat has the composition ThH_4 , and is readily dissociated at high temperatures.

The nitride obtained by heating thorium to redness in a current of nitrogen has the composition Th_3N_4 , and is slowly decomposed by cold water, but more rapidly on heating.

The hydride and the nitride burn in oxygen without incandescence.

C. H. B.

Hydrated Bismuth Oxide. By PAUL THIBAUT (*J. Pharm.*, 1900, [vi], 12, 559—561).—Bismuth oxide, prepared by the addition of an alkali to a solution of bismuth nitrate or chloride, always contains some basic nitrate or chloride. It may, however, be obtained free from these compounds by taking advantage of the fact that bismuth oxide is soluble in a solution of potassium hydroxide which contains glycerol.

Bismuth nitrate is intimately mixed with glycerol, water is added until the salt is entirely dissolved, and then potassium hydroxide until the precipitated oxide is redissolved. If dilute sulphuric acid is then added, a precipitate of bismuth oxide is produced, which is entirely free from any combined acid, and after drying in air, or in a vacuum over sulphuric acid, or at 100—105°, has the composition $\text{Bi}_2\text{O}_3, \text{H}_2\text{O}$.

H. R. LE S.

Soluble Bismuth Phosphate. By CLEMENTE MONTEMARTINI and U. EGIDI (*Gazzetta*, 1900, 30, ii, 421—446).—The preparation sold under the name of 'Bismuthum phosphoricum solubile' contains bismuth, sodium, and phosphoric acid, and is soluble in water. It is obtained by fusing together in certain proportions bismuth oxide, sodium hydroxide, and phosphoric acid. Its composition does not correspond with any formula representing the phosphorus present as either ortho-, meta-, or pyro-phosphoric acid, but agrees well with $\text{Bi}_5\text{Na}_{56}\text{P}_{39}\text{O}_{125}, 3\text{H}_2\text{O}$. After precipitating and removing the bismuth from the solution as sulphide, the phosphorus is found to be present mostly as metaphos-

phoric acid, together with small quantities of the pyro-acid. In concentrated solution, the compound undergoes rapid hydrolytic dissociation, whilst with dilute solutions the change takes place slowly in the cold, but quickly on boiling; in all cases, a white precipitate is obtained, consisting of a mixture of bismuth oxide and phosphate containing the whole of the bismuth, the liquid at the same time acquiring an acid reaction and answering to the tests for meta- and pyro-phosphoric acids. On electrolysing an aqueous solution of the substance, bismuth is deposited on the anode, and a mixture of bismuth oxide and phosphate is precipitated. The depression of the freezing point of an aqueous solution shows that the compound is resolved into a number of ions, and, notwithstanding the precipitation of bismuth phosphate and oxide, the depression continuously increases; the electrical resistance, in a similar manner, shows a gradual decrease. From aqueous solutions alkalis precipitate mixtures of bismuth oxide and phosphate, whilst hydrochloric acid precipitates bismuth metaphosphate. On suspending the compound in ethyl or methyl alcohol and passing a current of hydrogen sulphide through the liquid, no precipitation of bismuth sulphide occurs, but this immediately takes place on adding water.

T. H. P.

Reduction of Nitroso-compounds of Ruthenium and Osmium. By LÉOPOLD BRIZARD (*Ann. Chim. Phys.*, 1900, [vii], 21, 311—383).—The paper contains a very detailed account of a study of ruthenium double salts, some of the results having been already published (Abstr., 1899, ii, 559, 664).

Dihydorruthenium nitrosohydroxide, $\text{NO} \cdot \text{Ru}_2\text{H}_2(\text{OH})_3 \cdot 2\text{H}_2\text{O}$, produced either by the reduction of the nitrosohydroxide, $\text{NO} \cdot \text{Ru}(\text{OH})_3$, with an alkaline solution of formaldehyde or by the action of ammonia on potassium ruthenate, forms a gelatinous, dark-brown precipitate which on treatment with hydrochloric acid and potassium chloride yields the crystalline double chloride, $\text{NO} \cdot \text{R}_2\text{H}_2\text{Cl}_3 \cdot 3\text{KCl} \cdot 2\text{HCl}$; this salt is also obtained by the addition of potassium chloride to a solution of ruthenium nitroschloride, $\text{NO} \cdot \text{RuCl}_3$, or the double nitrite, $\text{Ru}_2(\text{NO}_2)_6 \cdot 4\text{KNO}_2$, reduced by boiling with stannous chloride. Although stable at 360° , the double salt decomposes at higher temperatures with evolution of nitrogen, chlorine, hydrogen chloride, and water; it is reduced by hydrogen at a dull red heat, the volatile products being ammonium chloride, hydrogen chloride, and water, whilst the residue consists of ruthenium and potassium chloride.

The crystals of the double salt are very sparingly soluble in cold water, and when dissolved in this solvent the substance exists in a partially dissociated condition, the amount of dissociation increasing as the temperature rises. Chlorine passed into the freshly-prepared solution of the double chloride yields a precipitate of ruthenium tetroxide.

The *oxychloride*, $\text{NO} \cdot \text{Ru}_2\text{H}_2\text{Cl}_2 \cdot \text{OH} \cdot 2\text{H}_2\text{O}$, is precipitated by the addition of potassium hydroxide to the aqueous solution, whilst excess of this reagent produces the hydroxide $\text{NO} \cdot \text{Ru}_2\text{H}_2(\text{OH})_3 \cdot 2\text{H}_2\text{O}$.

The *double ammonium chloride*, $\text{NO} \cdot \text{Ru}_2\text{H}_2\text{Cl}_3 \cdot 2\text{HCl} \cdot 3\text{NH}_4\text{Cl}$, is produced on adding excess of ammonium chloride to the aqueous solution

of the corresponding potassium salt; the *silver* salt has a similar composition, $\text{NO} \cdot \text{Ru}_2\text{H}_2\text{Cl}_3 \cdot 2\text{HCl} \cdot 3\text{AgCl}$.

Dihydorruthenium nitrosochloride, $\text{NO} \cdot \text{Ru}_2\text{H}_2\text{Cl}_3 \cdot 2\text{HCl}$, is an amorphous reddish-brown precipitate obtained on evaporating to dryness the hydrochloric acid solution of the corresponding oxychloride or hydroxide.

Ammoniodihydorruthenium nitrosochloride,



prepared by the action of ammonia on the preceding double chlorides, separates in orange-yellow crystals.

The double *salt*, $\text{NO} \cdot \text{Ru}_2\text{H}_2\text{Cl}_3 \cdot 2\text{HCl} \cdot 3\text{KBr}$, produced by adding potassium bromide to a hydrochloric acid solution of dihydorruthenium nitrosochloride, separates in brown, anisotropic crystals sparingly soluble in water; it yields the oxychloride, $\text{NO} \cdot \text{Ru}_2\text{H}_2\text{Cl}_2 \cdot \text{OH}$, on treatment with potassium hydroxide.

The double *bromide*, $\text{NO} \cdot \text{Ru}_2\text{H}_2\text{Br}_3 \cdot 2\text{HBr} \cdot 3\text{KBr}$, and the *ammonio-derivative*, $\text{NO} \cdot \text{Ru}_2\text{H}_2(\text{NH}_3)_6\text{Br}_3 \cdot 2\text{HBr}$, are obtained by methods similar to those employed for the chlorine derivatives; it was, however, found impossible to isolate the corresponding double iodides.

The double *silver nitrite*, $\text{Ru}_2\text{H}_2(\text{NO}_2)_4 \cdot 3\text{AgNO}_2 \cdot 2\text{H}_2\text{O}$, is a brownish-yellow precipitate produced by adding silver nitrate to a cold solution of the corresponding potassium salt (compare Abstr., 1899, ii, 664), on double decomposition with ammonium chloride, it yields the corresponding double *ammonium salt*, $\text{Ru}_2\text{H}_2(\text{NO}_2)_4 \cdot 3\text{NH}_4\text{NO}_2 \cdot 2\text{H}_2\text{O}$.

Potassium aminochloro-osmate, $\text{NH}_2 \cdot \text{OsCl}_2 \cdot 2\text{KCl}$, is a crystalline salt prepared by reducing potassium osmiate with stannous chloride; its *hydrochloride* has the composition indicated by the formula $\text{NH}_2 \cdot \text{OsCl}_3 \cdot 2\text{KCl} \cdot \text{HCl}$. The solutions obtained by reducing the osmiate with formaldehyde or ferrous chloride do not yield crystallisable double salts.

G. T. M.

Mineralogical Chemistry.

Enrichment of Mineral Veins by Later Metallic Sulphides. By WALTER HARVEY WEED (*Bull. Geol. Soc. Amer.*, 1900, 11, 179—206).

—Silver, copper, lead, &c., may be leached out as carbonates and sulphates from the upper gossan zone of mineral veins, and carried down by surface waters to be reduced again by sulphides of iron in the unaltered portions of the vein. Rich secondary deposits of sulphides may thus be formed in veins which are in other parts poor. These changes are discussed in detail, and suggestions are made as to the nature of the chemical reactions which may take place. L. J. S.

Mohawkite, Stibio-domeykite, Domeykite, Algodonite and some Artificial Copper Arsenides. By GEORGE A. KOENIG (*Amer. J. Sci.*, 1900, [iv], 10, 439—488).—General notes are given of the occurrence of copper arsenides in the Lake Superior copper mining

region, and two new ones are described under the names mohawkite and stibio-domeykite. *Mohawkite* from the Mohawk mine, Keweenaw Co., Michigan, is massive and very brittle; the colour is grey with a tinge of yellow, tarnishing easily to dull purple. Analysis I gives the formula $(\text{Cu}, \text{Ni}, \text{Co})_3\text{As}$; the mineral is therefore a nickeliferous domeykite (Cu_3As) . Domeykite from the Sheldon-Columbia mine gave II. Crystallised domeykite was produced by heating together copper and arsenic; the arsenide, Cu_2As , is also formed at the same time. *Stibio-domeykite* (anal. III), from the Mohawk mine, differs only from ordinary domeykite in containing a small percentage of antimony, amounting in one specimen to 1.29. Analysis IV (also CaCO_3 , 2.41; MgCO_3 , 0.60) is of an intimate mixture of mohawkite and whitneyite; as shown by other analyses, this mixture varies in composition. Algodonite, of a steel-grey colour, from the Pewabic mine gave V.

	As.	Sb.	Cu.	Ni.	Co.	Fe.	Total.	Sp. gr.
I.	28.85	—	61.67	7.03	2.20	trace	99.75	8.07
II.	26.14	—	74.00	0.06			100.20	7.9486
III.	26.45	0.78	72.48	0.24			99.95	7.902
IV.	15.07	—	79.36	0.61	0.82	0.36	99.23	—
V.	16.08	—	83.72	0.08			99.88	8.383

L. J. S.

Tellurides from Colorado. By CHARLES PALACHE (*Amer. J. Sci.*, 1900, [iv], 10, 419—427).—Sylvanite has already been inferred to be present in the telluride ores of Cripple Creek (Abstr., 1896, ii, 612, 613), and recently crystals have been found in several of the mines. A detailed crystallographic description is given of this new material. The habit is tabular parallel to (010), or prismatic parallel to the zone [111, 010], and some crystals are twinned on (101). Sp. gr. 8.161. Analysis of crystals gives results agreeing with the sylvanite formula, AuAgTe_4 .

An.	Ag.	Te.	Fe.	Insol.	Total.
26.09	12.49	60.82	1.19	1.02	101.61

The goldschmidtite of Hobbs (Abstr., 1899, ii, 493) is shown to be crystallographically identical with sylvanite, the habit and twinning being the same as for the crystals now described. In an accompanying note, W. H. Hobbs admits this identity, and remarks on the untrustworthiness of his analysis, which had to be made on a very small sample.

Hessite crystals from Colorado are described; these, although cubic, are rhombohedral in habit.

L. J. S.

Opals from Tuscany. By GIOVANNI D'ACHIARDI (*Jahrb. Min.*, 1900, ii, 348—350; from *Atti Soc. Toscana Sci. Nat. Proc. Verb.*, 1899, 11, 114—136).—Determinations of the chemical and optical characters are given for seven varieties of opal from various localities in Tuscany. Analysis I is of grey, almost colourless, transparent opal occurring as nodules in serpentine at San Piero, Elba; thin sections are optically isotropic. II, Opaque, milk-white opal occurring with, and graduating into, the last; the porcellaneous appearance is due to enclosed air,

it is almost isotropic. III, Black opal, as pitch-like blocks at the contact of serpentine and granite from the same locality; it is in part feebly birefringent, and encloses bastite, iron oxides, zircon, and garnet. IV, Grey opal from Jano; this is a silicified serpentine, and is veined with chalcedony; it is almost isotropic. V, Red and grey opal occurring with serpentine at Impruneta. VI, Fiorite, from Santa Fiore, Monte Amiata, is of different origin from the above, and has been formed in water through which silicon fluoride has bubbled; it consists of alternate layers of isotropic opal and birefringent chalcedony. VII, Diatomaceous earth from Castel di Piano, Monte Amiata.

	I.	II.	III.	IV.	V.	VI.	VII.
SiO ₂	89.55	86.54	82.11	87.62	83.13	—	—
Al ₂ O ₃	0.49	1.73	{ 1.61	{ 1.45	3.43	—	—
Fe ₂ O ₃			{ 5.50	{ 1.71			
CaO	0.63	0.55	1.57	0.36	0.81	—	—
MgO	0.57	0.74	trace	0.47	1.73	—	—
H ₂ O { 80—90° ...	1.02	5.68	5.50	4.90	4.18	0.22	5.98
{ 130—320°	6.48	3.15	2.49	1.24	3.18	2.96	1.97
at red heat...	0.53	0.57	1.09	0.60	1.87	2.29	3.57
Total H ₂ O	8.03	9.40	9.14	6.74	9.23	5.47	11.52
	99.27	98.96	99.93	98.35	98.33	—	—
Sp. gr.....	1.99—2.03	1.94—1.97	2.065	—	—	—	—

Curves are given showing the amounts of water given off at different temperatures for each of these opals. The total water present and the temperature at which it is lost, depends on the origin and the nature of the material; for those of primary origin (I and VI) little water is lost below 100°. No definite formula can be given for opal.

L. J. S.

Chromite from Kraubat, Upper Styria. By FRANZ RYBA (*Zeit. prakt. Geol.*, 1900, 337—341).—Here, as at other localities (Abstr., 1899, ii, 494), chromite occurs as a concentrated primary constituent in olivine-rock, which is usually altered to serpentine. Analysis of the chromite by R. Vambera gave:

SiO ₂ .	MgO.	CoO[?].	FeO.	Al ₂ O ₃ .	Cr ₂ O ₃ .	Total.
4.3	9.7	6.4	9.1	13.7	56.2	99.4

L. J. S.

Dolomite from Ceylon. By EMIL CHR. SCHIFFER (*Inaug.-Diss. München*, 1900, 32—45).—A coarsely crystalline dolomite occurring as a band in gneiss at Wattegama contains numerous mineral enclosures, of which the following analyses (in each case the mean of two or more) are given. Selected clear rhombohedra of dolomite gave the results under I; cleavage angle, 73°43'; sp. gr., 2.896. The rough material is shown by analysis II to be also normal dolomite:

	CO ₂ .	CaO.	MgO.	Gangue.	Total.
I.	47.72	30.45	21.87	—	100.04
II.	46.88	31.12	20.85	0.87	99.72

Rounded prismatic crystals of sky-blue apatite gave the results under III :

	P ₂ O ₅ .	CaO.	FeO.	MgO.	Cl.	F.	H ₂ O.	Total less O for Cl, F).
III.	40·19	54·43	1·16	1·20	1·06	3·16	Nil.	99·63

Phlogopite as light brown, pyramidal crystals and scales with $2E=14^{\circ}23'$, gave IV. Hydrophlogopite occurs as globular and vermiform masses of a lighter colour than the phlogopite, with which it is often intergrown, and of which it is an alteration product ; analysis V shows it to differ from phlogopite in containing less alkalis and more water, and to differ from the vermiculites in containing more alkalis. Pale green serpentine, occurring as irregular and small globular masses, gave results (VI), indicating that it has been derived from forsterite. Snow-white serpentine gave VII, which agrees, like the last, with the formula, $H_6R_3''Si_2O_{10}$.

	SiO ₂ .	Al ₂ O ₃ .	CaO.	MgO.	Na ₂ O.	H ₂ O.	Total.
IV.	39·71	15·48	—	28·53	8·99	5·59	98·30
V.	40·13	14·24	—	23·78	7·69	13·49	99·33
VI.	39·29	1·78	1·82	39·04	—	18·15	100·08
VII.	39·65	3·18	1·75	38·60	—	16·53	99·71

Pyrites occurs as crystals and grains, but is usually represented by limonite pseudomorphs. Analysis gave : Fe 44·99, S 53·79, gangue $1·22=100·00$.

Spinel and pyrrhotite are also present as enclosures in the dolomite.
L. J. S.

Minerals of Ceylon. By FR. GRÜNLING (*Zeit. Kryst. Min.*, 1900, 33, 209—239).—An account of a mineralogical expedition to Ceylon. Several analyses of minerals by E. C. Schiffer are given (compare preceding abstract).
L. J. S.

Influence of the Presence of Iron on the Change in State of Boracite. By FRIEDRICH RINNE (*Jahrb. Min.*, 1900, ii, 108—116).—Crystals of boracite which contain iron (up to 7·9 per cent. FeO) have a more or less pronounced greenish tint. With increase in temperature the colour gradually becomes deep bluish-green, but this change takes place before, and is not connected with, the change from the rhombic to the cubic modification of boracite. In boracite containing iron, the temperature at which the change in state takes place is sensibly higher (285°) than in colourless boracite (265°), and the change takes place less sharply. At 285° , the birefringence of iron-boracite becomes much weaker, the division into fields, as seen in polarised light, becomes different ; even at 400° , the material is not wholly isotropic. These optical anomalies, which are described in detail, are considered to be due to the isomorphous mixing of iron- and magnesium-boracite.

L. J. S.

Robellazite, a new Mineral. By E. CUMENGE (*Bull. Soc. franç. Min.*, 1900, 23, 17—18).—This was found in Colorado by M. Robellaz as small, black, concretionary masses associated with carnotite (Abstr., 1899, ii, 434 ; 1900, ii, 599). From qualitative tests, it appears to be

a niobate, tantalate, and tungstate of vanadium, with aluminium, iron, and manganese.

L. J. S.

Apophyllite from Sulitelma. By ANDERS HENNIG (*Jahrb. Min.*, 1900, ii, Ref. 354—357; from *Geol. För. Förh.*, 1899, 21, 391—415).—Apophyllite from Mount Sulitelma, in northern Scandinavia, forms, with stilbite, a crust on pyritiferous quartz. The weathered crystals on the exterior are white and opaque, but the inner ones are colourless and transparent. Measurements are given of the numerous vicinal faces, which are more abundant on the cloudy, weathered crystals; these appear to be connected with a loss of water, since they may be artificially developed by simply heating the crystals. The optical examination shows the presence of a central portion of "chromocyclite" surrounded by leucocyclite, and the change in the optical characters observed on heating the isolated "chromocyclite" suggests that the latter has been derived from the former by the loss of about 2 per cent. of water. The following analysis of crystals, by L. Ramberg, gives the formula $\text{Ca}(\text{CaF}_2, \text{K}_n)\text{Si}_2\text{O}_5, 2\text{H}_2\text{O}$. Numerous determinations are given of the loss of water, at different temperatures, of apophyllite from various localities:—

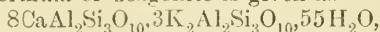
SiO_2 .	$\text{Al}_2\text{O}_3(\text{Fe}_2\text{O}_3)$.	CaO .	K_2O .	Na_2O .	H_2O .	F.	Total.
52·61	2·23	23·82	4·96	0·05	15·67	1·24	100·58

L. J. S.

Zeagonite as a new Alteration Product of Nephelite. By STANISLAUS J. THUGUTT (*Bull. Internat. Acad. Sci. Cracow*, 1899, 168—169; and *Jahrb. Min.*, 1900, ii, 65—79).—Analysis I is of partially altered nephelite isolated by means of a heavy liquid from the nephelinite of Löbau, Saxony; II is of an alteration product, referred to zeagonite, of the nephelite. Other analyses of mixtures of these are given. The figures under III, which are assumed to represent the true composition of zeagonite, are calculated from II by deducting the residue insoluble in hydrochloric acid, 13·97 per cent. of nephelite (calculated from Na_2O , 1·93) and 4·43 per cent. of limonite (assuming the excess of the molecular ratio 1 : 1 of sesquioxides over other bases to be due to Fe_2O_3):

	SiO_2 .	$\text{Al}_2\text{O}_3, \text{Fe}_2\text{O}_3$.	CaO .	MgO .	K_2O .	Na_2O .	Insol.	H_2O .	Total.
I.	42·69	33·51	2·50	0·10	4·49	14·24	1·10	1·59	100·22
II.	38·97	26·03	7·47	0·25	4·60	1·93	3·01	16·80	99·06
III.	42·34	22·77	—	9·10	0·31	5·10	—	20·38	100·00

From III the formula of zeagonite is given as



to be in conformity with the author's constitutional formula for nephelite, namely, $8\text{Na}_2\text{Al}_2\text{Si}_3\text{O}_{10}, 4\text{Na}_2\text{Al}_2\text{O}_4, 3\text{K}_2\text{Al}_2\text{Si}_3\text{O}_{10}$ (*Abstr.*, 1895, ii, 358). As represented by these formulæ, the alteration from nephelite to zeagonite could be effected by water containing calcium salts. Zeagonite [= gismondite] usually occurs as crystals lining the cavities of rocks, but in the case here described it penetrates the whole rock as a pseudomorph after nephelite, the usual alteration products of which are natrolite, mica or cancrinite.

L. J. S.

"Blue Asbestos" [Crocidolite]. By H. F. OLDS (*Trans. Inst. Mining and Metallurgy*, 1899; and *Eng. and Mining J.*, New York, 1899, 67, 528).—The crocidolite or "blue asbestos" of Griqualand West occurs as veins in dark brown shale. It is mined to a considerable extent for commercial purposes. The composition is:

SiO ₂ .	FeO.	MgO.	Na ₂ O.	H ₂ O.	Total.
51.1	35.8	2.3	6.9	3.9	100.0

L. J. S.

Minerals [Garnet] from the Fichtelgebirge. By ERNST DÜLL (*Jahrb. Min.*, 1900, ii, Ref. 357—359; from *Beil. z. Jahresh. k. Luitpold-Kreisrealschule in München*, 1899, 8, 47 pp.).—A description is given of the minerals from fragments of an albite-bearing phyllite-gneiss found near Schönbrunn in the Fichtelgebirge. These include secondary minerals present throughout the rock, and also minerals occurring in veins. A green garnet, in rhombic-dodecahedral crystals, is the most prominent; the following analysis proves this to be topazolite, and not grossularite as formerly supposed:

SiO ₂ .	TiO ₂ .	Fe ₂ O ₃ .	Al ₂ O ₃ .	FeO.	CaO.	MnO.	MgO.	Total.
36.65	0.40	18.48	9.07	0.82	34.04	trace	trace	99.46

L. J. S.

Chemical and Mineralogical Constituents of Keuper Marl. By ERNST ANTON WÜLFING (*Jahresh. Ver. vaterl. Naturk. Württemberg*, 1900, 56, 1—46).—An attempt is made to determine the mineralogical composition of red and green marls from the Keuper beds near Tübingen. Bulk analyses of the same samples have already been published (*Ber.*, 1899, 32, 2214). Under the microscope, minute grains of quartz, orthoclase, mica, rhombohedral carbonates, &c., may be recognised; and from analyses of the portions soluble in acids of various strengths and temperatures is inferred the presence of a chlorite having the composition $2\text{MgO}, \text{Al}_2\text{O}_3, 2\text{SiO}_2, 2\text{H}_2\text{O}$, a clay of the composition $\text{Al}_2\text{O}_3, 4\text{SiO}_2, 2\text{H}_2\text{O}$, and some kaolin. The relative amounts of each of these constituents vary very considerably in the different samples. The name *geolyte* is proposed to replace the term "Bodenzeolith" used by agricultural chemists for those constituents of soils which are easily soluble and of undefinable mineralogical composition, but which have little in common with zeolites. L. J. S.

Carbonaceous Gneiss in the Black Forest. By HARRY ROSENBUSCH (*Mitteil. Grossh. Badischen Geol. Landesanst.*, 1899, 4, 9—48).—The gneisses of the Black Forest have been derived from both sedimentary and igneous rocks. Those derived from sedimentary rocks often contain carbon in the form of small scales of graphite or as graphitoid. The latter, as a dull, very fine dust, impregnates the whole rock, but only surrounds, and is not included in, the mineral grains; it is probably of organic origin. The rock with graphitoid gives off ammonia when heated; it contains free carbon, 1.31, nitrogen, 0.081 per cent. The residue obtained on dissolving

the rock in hydrofluoric and sulphuric acids gave, on analysis by Mohr :

C.	N.	H ₂ O.	Residue.	Total.
77.4	1.2	3.5	16.1	98.2

L. J. S.

Average Composition of British Igneous Rocks. By ALFRED HARKER (*Geol. Mag.*, 1899, N.S. Dec. iv, 6, 220—222).—The mean of 397 published analyses of British igneous rocks is given under I; corrections have been made for TiO₂ and MnO, but not for Fe₂O₃ and FeO. The mean sp. gr. of 736 rocks is 2.763. With this is compared F. W. Clarke's mean (II) of 680 analyses of American rocks :

	SiO ₂ .	TiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	MnO.	MgO.
I.	58.46	0.69	15.13	5.34	2.40	0.40	3.84
II.	59.77	0.53	15.38	2.65	3.35	0.09	4.40

	CaO.	Na ₂ O.	K ₂ O.	H ₂ O.	P ₂ O ₅ .	Total.
I.	4.98	3.25	2.74	2.23	0.25	99.71
II.	4.81	3.61	2.83	1.51	0.21	99.14

Taking rocks from special districts, other mean values are obtained. The mean silica percentage of 96 rocks from the English Lake district is 58.75, and the mean sp. gr. of 113 is 2.737. Of 82 Malvern rocks the mean silica percentage is 54.81, and the mean sp. gr. of 38 is 2.841.

L. J. S.

Mud from the Salt Mines of Ischl. By E. WIENER (*Chem. Centr.*, 1900, ii, 1185; from *Wien.klin. Woch.*, 1900, 13, 646—648).—Mud deposited in the salt mines at Ischl, in Salzburg, possesses therapeutic properties and consists of gypsum and clay with sodium chloride, &c. Analyses are given of the portions soluble in water and dilute acid.

L. J. S.

Salt Lakes of Roumania. By PAUL BUJOR (*Ann. Sci. Univ. Jassy*, 1900, 1, 149—186).—A list of the salt lakes of Roumania is given, and two of them are described in detail, with chemical analyses of the water and mud.

L. J. S.

Hot Springs of Gastein. By ERNST LUDWIG and THEODOR PANZER (*Tsch. Min. Mitth.*, 1900, 19, 470—488; and *Wien. klin. Woch.*, 1900, 13, 617—622).—Near Gastein in Salzburg there are 18 hot springs which issue from an intrusive mass of granite-gneiss. The temperature varies from 24.4° to 49.4° in the different springs. An analysis is given of water from the Elizabeth spring of which the temperature is 49.1°; sp. gr. 1.000367. The results obtained agree closely with those of earlier analyses made at various times since 1828.

L. J. S.

Composition of a Sulphated Calcareous Water at Lautaret (Hautes-Alpes). By JOSEPH A. MULLER (*Bull. Soc. Chim.*, 1900, [iii], 23, 910—912).—The temperature of this water is sensibly constant at about 25.3°. It yields a solid residue of 5.216 grams per kilogram, consisting chiefly of sodium chloride, calcium carbonate, and calcium, magnesium and sodium sulphates.

N. L.

Physiological Chemistry.

The influence of Sterilised Air on Animals. By J. J. KIJANITZIN (*Virchow's Archiv*, 1900, 162, 515—533).—The experiments were made on rabbits, and the apparatus used for supplying them with sterilised air is described and figured. Under these circumstances, the metabolic functions are reduced, and the animals waste. This is considered to support the author's previous contention, that the micro-organisms of the atmosphere play a useful part in metabolism. Their special function is considered to be to provide the blood with oxidising ferments, as in their absence the oxidation changes in the organism are diminished, and this leads to an accumulation of intermediate waste products of metabolism (leucomaines).
W. D. H.

Metabolism of Creatinine. By J. J. R. MACLEOD (*Proc. Physiol. Soc.*, 1900, vii—viii).—The creatinine excreted in the urine may be divided into an endogenous portion arising during metabolism, and an exogenous portion from the creatine and creatinine of the food. In order to investigate the first of these, a diet must be taken free from creatine and creatinine. The experiments indicate that urea does not arise from creatinine. In cases of muscular atrophy, no diminution was noted. In cases of splenic enlargement, the creatinine excreted was only half the normal amount. It is probable that the spleen exercises some control over creatinine metabolism. The number of leucocytes in the blood does not influence the amount excreted. Further experiments are in progress.
W. D. H.

Metabolism of Hippuric Acid. By ADOLF JÖLLES (*Pflüger's Archiv*, 1900, 82, 553—558).—On the administration of hippuric acid, all the nitrogen appears as urea. It is regarded as probable that in the oxidation processes of proteids in the body, of which the final product is urea, glycine and other amino-acids are in part formed, which are ultimately oxidised to form urea.
W. D. H.

Metabolism in Cephalopods. By OTTO VON FÜRTH (*Zeit. physiol. Chem.*, 1900, 31, 353—380).—A historical review of this subject is followed by a description of the method adopted of collecting large quantities of urine from the octopus. A sediment found in some cases contains uric acid. The fluid contains ammonia, but no urea; a number of other products of nitrogenous katabolism were also sought for, but in the main with negative results. The most striking fact is the presence of proteid; albuminuria appears to be in these animals a physiological process.
W. D. H.

Estimation of Rennet-ferment in Gastric Juice. By LÉON MEUNIER (*J. Pharm.*, 1900, [vi], 12, 457—465).—The amount of rennet-ferment in gastric juice is estimated by the time required for a known volume of the gastric juice to produce coagulation in a milk which is kept at 40—41°, and to which a small quantity of calcium chloride has been added. The strength of the gastric juice in rennet-

ferment is defined as the amount of milk coagulated by unit volume of the gastric juice in 10 minutes and under the conditions of experiment described in the paper. A standard milk was used for all the experiments and was prepared as follows. Several samples of fresh milk were mixed together, boiled, and filtered from the precipitated albumin. The filtrate was then boiled and when boiling was poured into small flasks which were then corked, and heated at 115° for 10 minutes. The following conclusions were arrived at: (1) Rennet-ferment keeps very well in the gastric juice. (2) The secretion of rennet-ferment in adults reaches its maximum one hour after the partaking of a meal consisting of bread and tea, and remains at a maximum until the end of the digestive period. (3) In normal cases, the "strength in rennet-ferment" varies between 500 and 2000. (4) In pathological cases, a diminution in the amount of rennet-ferment gives valuable information as to the condition of the glandular structure of the membrane of the stomach.

H. R. LE S.

Alkalinity of the Blood. By WALDVOGEL (*Chem. Centr.*, 1900, ii, 1156; from *Deutsch. med. Zeit.*, 28, 685—686).—A number of estimations of the alkalinity of the blood were performed by a modification of the Salkowski-Schlösing method. The alkalinity is lessened in typhoid fever, but there is no parallelism between rise of temperature and fall of alkalinity.

W. D. H.

Glycolytic Decomposition of Sugars. By P. PORTIER (*Compt. rend.*, 1900, 131, 1217—1218).—When blood is collected and preserved under aseptic conditions, the amount of dextrose which it contains rapidly diminishes, the rate of disappearance of this sugar varying with the temperature.

It is found that small quantities (0.2 per cent.) of galactose, lævulose, and maltose are similarly decomposed when added to the blood of the dog or rabbit, whilst sucrose, lactose, and xylose remain unaltered.

G. T. M.

Effect of Intravenous Injection of Milk on the Coagulability of the Blood. By L. CAMUS (*Compt. rend.*, 1900, 131, 1309—1312).—If cow's milk is freed from cream by the centrifuge and injected intravenously into dogs, the blood of the latter animals is rendered incoagulable. The substance to which this is due has not been determined, but it is not a lysin, as boiling does not affect the action. Dog's milk injected into dogs has the same effect. Dogs differ somewhat in their reaction to the injection, and this probably accounts for Delezenne's statement that dogs are refractory in this particular to dogs' milk. Delezenne's suggestion that this refractiveness is most marked in dogs during the lactation period has not yet been experimentally tested.

W. D. H.

Osmosis in Marine Invertebrates. By R. QUINTON (*Compt. rend.*, 1900, 131, 905—908, 952—955).—The experiments recorded do little more than confirm what Fredericq found in 1882 (*Bull. Acad. Roy. Belg.*, 4, 209), namely, that in many marine forms the salts in the hæmolymp are the same as those in the sea. The outer membrane of these animals simply plays the part of a membrane as in physical osmosis.

W. D. H.

Muscular Serum. By CHARLES RICHTER (*Compt. rend.*, 1900, 131, 1314—1316).—The term muscular serum is applied to the richly albuminous fluid which can be expressed from flesh that has undergone rigor. It has the following percentage composition (from beef):

Dry residue	6.71
Ash	0.89
Total nitrogen	1.05
Nitrogen from proteids	0.8
Nitrogen from substances soluble in hot alcohol..	0.25

Of the mineral matters, potassium phosphate is the most abundant. The serum contains small quantities of sugar, hæmoglobin, and myohæmatin (?). Injected under the skin or into a vein, 5 c.c. per kilo. of body weight produces a fall of blood pressure, stupor, and death in from 24—48 hours; 3 c.c. produce the same effects more slowly. The blood is coagulable. Abdominal congestion is the most marked appearance *post mortem*. Boiling destroys the toxic properties. Given by the mouth, the serum is harmless, and is even stated to cure inoculated tuberculosis in dogs.

W. D. H.

Proteids of Invertebrate Muscle. By OTTO VON FÜRTH (*Zeit. physiol. Chem.*, 1900, 31, 338—352).—It is possible to obtain from the muscles of invertebrate animals a muscle plasma which coagulates spontaneously. Most of the experiments recorded were performed with the muscles of cephalopods (octopus and sepia), but holothurian muscle gave also corresponding results. The proteids separated out differ in various points (coagulation temperature, precipitability by salts, &c.) from the myogen and myosin previously described by the author in mammalian muscle.

The paper concludes with a discussion of the dependence of heat rigor on the heat coagulation temperature of the proteids in muscle. No reference, however, is made to the work of Brodie, who was the first to demonstrate the connection.

W. D. H.

Thiocyanates in Nasal and Conjunctival Secretion. By O. MUCK (*Chem. Centr.*, 1900, ii, 1157—1158; from *Münch. med. Woch.*, 47, 1168—1169).—The presence of potassium thiocyanate can be shown in the nasal secretion as well as in the saliva. This, however, originates from the secretion of the conjunctiva. In ozæna, the amount here, and in the saliva, sinks.

W. D. H.

Solubility of Pigments in Fats and Soaps. By JOSEPH NERKING (*Pflüger's Archiv*, 1900, 82, 538—540).—The general conclusion arrived at is that the pigments recently used in experiments in fat absorption which are soluble in fats, are also soluble in neutral solutions of soaps.

W. D. H.

Anti-coagulating Agents. By ERNST P. PICK and KARL SPIRO (*Zeit. physiol. Chem.*, 1900, 31, 235—281).—A review of past work shows how numerous and diverse are the various organic substances and extracts that, like 'peptone,' produce a non-coagulable condition of the blood. Experiments with fibrin show that the products of peptic digestion, or of digestion with acid alone, have this power, but

that the products obtained by tryptic digestion, by digestion with alkali alone, or by autolysis, have no such power. From pure proteids, however (edestin, casein), no anti-coagulating agent is obtained by any method. The products formed from fibrin by acid or gastric digestion lose this action when they are purified. Thus pure proto-albumose and heteroalbumose are inert, but a mixture of the two does not lose its power when they are purified by the ammonium sulphate method, but it does so after treatment with alcohol. Treatment of the fibrin beforehand with alcohol does not hinder it from yielding the anti-coagulating agent on subsequent treatment with acid or gastric juice. This agent is, however, destroyed by alcohol in a weakly alkaline but not in an acid solution. Acid-albumin prepared from fibrin is inactive. Not only does 'peptone' lose its anti-coagulating power by such treatment, but its other actions (on blood-alkalinity, on lymph formation, on blood pressure, and in the production of narcosis) disappear also. The anti-coagulating substance, whatever it is, must be present in small quantity, and be very active. It is not characteristic of digestion products, but is contained in extracts of various tissues, particularly of the digestive organs, and these, especially if fresh, contain little or often no peptone. The name 'peptozyme' is suggested for this active substance, and the material in fibrin, liver, &c., from which it is derived, is termed 'peptozymogen.' Many authors distinguish the action of so-called peptone from such a substance as leech extract by saying that the latter contains an anti-thrombin, whilst the action of peptone is to first produce an anti-thrombin within the body by acting on some organ like the liver. This theory is discussed, and it is shown that the peptozyme has a direct anti-thrombic action on blood *in vitro*. It is also shown that peptozyme-immunity is independent of its anti-coagulating activity.

W. D. H.

Immediate Action of Intravenous Injection of Blood-serum. By THOMAS GREGOR BRODIE (*J. Physiol.*, 1900, 26, 48—71).—The intravenous injection of blood-serum from any source into a cat causes arrest of respiration, inhibition of the heart, and vascular dilatation. The effect is due to excitation of the pulmonary nerves, and the effect on the heart is reflex. It is abolished by section of the vagi, or of its pulmonary branches. Some degree of immunity is produced by repeated injections. The active substance is of proteid nature, of the albumin class, and is coagulated at 86°. It is produced only when the blood clots, but the interaction of the blood corpuscles is also necessary for its formation. Serum obtained from plasma is inactive.

W. D. H.

Injection of Tetanus Toxin and Antitoxin into the Sub-arachnoid Space. By FRANCIS RANSOM (*Zeit. physiol. Chem.*, 1900, 31, 282—304).—Injection of tetanus toxin or antitoxin into the sub-arachnoid space is quickly followed by the passage of these substances almost entirely into the blood-stream. An increase in the normal power of the central nervous system to neutralise the poison after sub-arachnoid injection of antitoxin does not occur *in vitro*. After injection of the toxin, the nerve substance is more poisonous, probably

because it contains more poison in its blood. After sub-arachnoid injection of the poison, a small part is found in the cerebro-spinal fluid, part in the blood and lymph, and part in the central nervous system. After intravenous or subcutaneous injection, little or none finds its way into the cerebro-spinal fluid. If the blood has high anti-toxic value, the cerebro-spinal fluid is also anti-toxic, but in a smaller degree. Much interest attaches to the fact that toxin and antitoxin pass from the blood to the lymph, but in the case of the cerebro-spinal fluid, the passage is in the contrary direction.

W. D. H.

Chemistry of Vegetable Physiology and Agriculture.

Biology of the Peptonising Bacteria of Milk. By OTTO KALISCHER (*Arch. Hygiene*, 1900, 37, 30—53).—The bacteria in milk, which are aërobic or facultative anaërobic, are not destroyed by heating at 90—95°, and form spores not easily destroyed by heat, are termed “peptonising” bacteria. In milk, they slowly form ammonia and cause a diminution of the lactose, decompose dextrose, but not fat, and convert casein into peptone. The enzyme produced by them is very similar to trypsin, except that in the fermentation of casein by it, aromatic hydroxy-acids are formed in addition to peptone, leucine, and tyrosine; it will invert cane sugar, but not lactose.

R. H. P.

Lactic Acid Fermentation and its Practical Use. By STANISLAUS EPSTEIN (*Arch. Hygiene*, 1900, 37, 329—359).—The ripening of cheese is due to the organisms which induce the lactic acid fermentation. Each kind of cheese is produced by the agency of special organisms, which act chemically by means of an enzyme, and cause the peculiar odour of the cheese. If pure cultures are to be employed in the preparation of cheese, it will therefore be necessary to choose these, not only with regard to the character of the bacteria inducing the acid fermentation in the butter, but also with regard to the peculiar kind of cheese required.

R. H. P.

Formation of Hydrogen Sulphide in Sewers, and the New Genus *Aërobacter*. By MARTINUS W. BEYERINCK (*Arch. Néerland Sci. Exact. Nat.*, 1900, [ii], 4, 1—18).—The author proposes to include in a new genus *Aërobacter* such bacteria as ferment sugar with the formation of hydrogen, carbon dioxide, and levorotatory lactic acid. These are the agents which cause the formation of hydrogen sulphide from sulphur, sulphites, thiosulphates, and proteids. The formation of this gas, which is also a characteristic of the genus, is easily demonstrated by the introduction of a little white lead into the culture media (gelatin or agar). The bacteria reduce nitrates to nitrites, but not to ammonia; the addition of a small quantity of a nitrate to a culture medium containing sugar prevents fermentation, but does

not stop the development of the organisms, thus, in the preparation of Dutch cheese ("rijzers"), a small percentage (0.05) of saltpetre is added to hinder the formation of gas. The fermentation of indican, due entirely to organisms belonging to this genus (and induced by all the species composing it, with the exception of *A. coli* var. *commune* = *Bacterium colis* var. *commune*), results in the formation of dextrose and indoxyl, which in the presence of air is converted into indigo, the fermentation being due to the living organisms and not to an enzyme. The bacteria of this genus cannot transform sulphates into hydrogen sulphide, this reduction being brought about by *Spirillum desulfuricans*. The nauseous odours of putrefaction are not due to sulphides.

R. H. P.

Influence of Temperature on the Energy of the Decomposition of Proteid in Germination. By DMITRI N. PRIANISCHNIKOFF (*Ann. Agron.*, 1900, 26, 627—628; from *Ber. deut. bot. Ges.*, 1900, 18, 285. Compare Abstr., 1900, ii, 233).—The temperature most favourable to the growth of the embryo is 28°, whilst the energy of respiration continues to increase as the temperature is raised. The energy of the decomposition of proteid, and the formation of asparagine increases up to 35—37°; this decomposition does not depend on the growth of the embryo.

N. H. J. M.

Chemical Changes during the Evolution of Buds. By GUSTAVE ANDRÉ (*Compt. rend.*, 1900, 131, 1222—1225).—Buds of *Æsculus hippocastanum* were analysed at seven different periods from February 26, when they showed no development, to April 28. The total dry matter, nitrogen, amides, carbohydrates, cellulose, ash, potassium, calcium, phosphoric acid, and silica in 100 buds were determined at each date; also the percentage of water.

As in the germination of seeds, there was a considerable absorption of water. There was first a loss of dry matter, but by April 18 there was again a slight increase; subsequently there was a very rapid and great increase both in dry matter and total ash. The calcium remained almost the same up to April 18, whilst the potassium and phosphoric acid greatly increased; afterwards there was a great increase in all the ash constituents determined. The increase in the amount of potassium coincides with the appearance of the first leaves. The amounts of phosphoric acid and total nitrogen were both tripled at the time when the buds recovered their original weight (April 18). The amide nitrogen increased from the beginning; the soluble nitrogen is presumably transformed into insoluble proteid nitrogen. Up to April 18, the soluble carbohydrates showed a remarkable decrease (9.12 to 2.85); by April 23 and 28, the amounts were 6.01 and 17.92 respectively.

The above changes indicate that the evolution of buds may be compared with germination.

N. H. J. M.

Development of Etiolated Plants after Exposure to Light. By H. RICOME (*Compt. rend.*, 1900, 131, 1251—1253).—The plants were kept in darkness for different periods and afterwards exposed to

normal conditions. Similar plants were kept the whole time under normal conditions.

In the case of etiolated plants from small seeds, the growth of the stems was checked the moment the plants were exposed to light, the growth being then slower than that of normal plants; with plants from large seeds, the growth of the stems after exposure to light did not appreciably differ from that of normal plants. The length of stem of the full grown plant is abnormally great when the etiolation ceased before the exhaustion of the reserve substances of the seed, but abnormally short when the reserve substances have been almost all consumed at the time when the plants had access to light.

The leaf development of etiolated plants also becomes abnormally large after exposure to light when there is plenty of reserve substance.

The weight of the dry matter (stems and leaves) is less in plants which were etiolated and afterwards exposed to light than in normal plants. As soon as the plants are exposed to light there is a great loss of water as well as gain in dry matter. Etiolated plants which afterwards have access to light weigh less, but contain more dry matter than plants kept in darkness during the whole period.

The above results show the importance of seed reserves which, to a great extent, enable the plant to develop without chlorophyllic action.

N. H. J. M.

Hydrolysis and Utilisation of Raffinose by *Penicillium Glaucum*. By HENRI GILLOT (*Bull. Acad. Roy. Belg.*, 1900, 99—127).—In a solution containing a mineral acid, *Penicillium glaucum* secretes an enzyme capable of inverting raffinose; neutralisation does not prevent this secretion, but diminishes the rapidity of germination of the spores. The action of the enzyme is accompanied by an increased acidity of the solution, due to the production of oxalic and succinic acids. Using the enzyme either in the form of an aqueous infusion of the fungus, or of the precipitate obtained from this infusion by adding alcohol, the intensity of the inversion gradually diminishes, if care be taken to exclude foreign organisms. In a solution containing 2 per cent. of raffinose, but no other nutritive materials, inversion still occurs, but the germination of the spores is slow, and the morphology of the mould is modified.

In alkaline solution, germination is retarded, the action of soda being less than that of either potash or ammonia; subsequently, however, when the mould has developed, the secretion of enzyme is but little affected, the solution gradually becoming acid.

W. A. D.

Chemical Processes in the Juice of *Arum Maculatum*. By MARTIN HAHN (*Ber.*, 1901, 33 3555—3560).—In the hope of throwing more light on the question of the cause of the heat developed by certain plants, the bulbs of *Arum maculatum* were divided so as to separate the upper or sterile from the lower or flower-producing parts, and these were then subjected to the process applied by Buchner to yeast-cells in isolating the cell-free juice.

The greenish liquids thus obtained, which were free from organised forms, were neutral at first, but finally developed a reddish tinge, and became acid in reaction. Both liquids decolorised a considerable

quantity of $N/10$ iodine solution, reduced Fehling's solution rapidly, and when heated deposited albumin. With alkalis, the liquids became bluish-green and with acids red.

In investigating the properties of the juices, 20 c.c. were brought into a flask fitted with a sulphuric acid valve, mixed with 0.5 c.c. of toluene, and the temperatures maintained at 25° ; after the completion of the digestion the whole was rendered neutral, boiled, diluted to 100 c.c., filtered, and aliquot portions of the clear liquid were employed for the estimation of the contained nitrogen and sugars; the sterility of the liquids was assured.

It was found that the amount of dextrose in the liquids slowly increased at low temperatures, indicating that a diastatic ferment is present, a fact which was confirmed by observations of the sucrose inverting power of the residues obtained by evaporating the juice in a vacuum. The presence of a proteolytic ferment was inferred, as after several days digestion at 25° , the liquids no longer deposited albumin when boiled, and were free from dextrose.

The manner in which the dextrose is degraded has not been ascertained; small quantities of carbon dioxide appear to be evolved, but no alcohol could be detected.

Attempts have been made to prepare an active, pulverulent extract by evaporation of the liquids, but these have hitherto met with only partial success. A. L.

Toxicity of Sodium, Potassium, and Ammonium Compounds as regards Higher Plants. By HENRI COUPIN (*Ann. Agron.*, 1900, 26, 575—577; from *Rev. gén. bot.*, 12, 177. Compare *Ann. Agron.*, 26, 350, and Demoussy, *Abstr.*, 1900, ii, 161).—Young wheat plants were subjected to the action of 21 sodium salts, 22 potassium salts, and 13 ammonium salts. The results are given in a table showing the minimum amounts of the various salts per cent. which kill the plants.

Comparing the haloid salts, it is shown that the toxicity increases with the mol. weight of the halogen. As a rule, potassium salts are less toxic for plants than the corresponding sodium salts. Oxalates, especially potassium hydrogen oxalate, are very toxic; the toxic equivalent of potassium hydrogen oxalate is 0.0033, that of potassium oxalate 0.25 per cent.

With one or two exceptions, the toxicities of the analogous compounds of sodium, potassium, and ammonium are similar.

The toxic equivalents of the three chlorides (in the order as given) are: 1.8, 1.9, and 1.6; nitrates, 1.7, 3.0, and 3.9; carbonates, 1.1, 1.7, and 0.3; phosphates, 1.5, 6.0, and 0.4; sulphates, 0.8, 2.3, and 2.5. The toxicity of sodium hydrogen carbonate is 0.6. N. H. J. M.

Humic Acid and its Function in Nature. By HUGO BORN-TRAEGER (*Chem. Centr.*, 1900, ii, 1202; from *Oesterr. Chem. Zeit.*, 3, 516—517).—Humic acid in presence of water is capable of absorbing a considerable quantity of ammonia, which it retains with some obstinacy. The ammonia is removed, however, by the action of the acid of sprouting seeds, humic acid being regenerated. Under certain conditions, humic acid also attacks the plant fibres, forming

sugar and vegetable gum. By treating 100 grams of fibre with 20 of humic acid (Cassel brown) and 20 of water under pressure, 8 grams of sugar and 20 of gum were obtained, but the sugar was not formed even by prolonged boiling under the ordinary pressure.

E. W. W.

Cultivation of Barley. By AIMÉ PAGNOUL (*Ann. Agron.*, 1900, 26, 561—567).—Experiments were made in pots, to show the effect of nitrogenous manure and phosphate on the growth of barley in different soils, both with small and large amounts of water, to correspond with very dry and very wet seasons. The seeds were sown on March 5.

On May 7 a number of plants were removed from each pot. It was found that the development of the plants was greatest under the influence of much water, but that the percentage of dry matter was lower in these plants (9.6) than in those which had less water (12.6). Comparing the different soils, the clay soil gave the worst results. Nitric nitrogen was more abundant in the wet than in the drier soils; the sandy soil contained the most nitrate, and the clay soil much the least.

When the plants were cut at the end of July, the yields were found to vary in the same order as in the plants taken up in May. The yields of straw and grain, in the case of the plants which received much water, were about double those of the plants with little water. With nitrogenous manure, the yield of straw was above, the yield of grain below, the average; with superphosphate, the yield of straw was below, and the yield of grain above the average. Superphosphate gave much heavier grain than nitrogenous manure.

All the plants were attacked by rust, the effect of which was to greatly diminish the weight of the seed, whilst the percentage of nitrogen and phosphoric acid was very greatly increased.

N. H. J. M.

Influence of the [Mode of] Distribution of Manures on their Action. By J. M. POMORSKI (*Chem. Centr.*, 1900, ii, 1249; from *Zeit. landw. Versuchs. Wesens Oesterr.*, 3, 649—683). [Compare Berthault, *Abstr.*, 1900, ii, 753].—The results of field experiments with oats showed that the localisation of sodium nitrate in furrows increased the amount of nitrogen taken up, and that the utilisation of nitrate by oats depends on the distance of the manure from the plants.

In pot experiments, it was found that nitrate had the same effect, whether mixed with the first, second, or third 10 centimetres of soil, but that better results were obtained when the manure was mixed with the whole of the soil.

Further experiments were made, the results of which showed that the mode of distribution of manures affects assimilation and growth, and that oats and barley behave differently.

The subject is thought to be of practical importance, as manures may be economised by being applied in the manner best adapted for the various crops.

N. H. J. M.

Analytical Chemistry.

Perchloric Acid. By CARL HAEUSSERMANN and ALB. SIGEL (*Ber.*, 1901, 33, 3598—3599).—The formation of a red coloration by the action of perchloric acid on aspidospermine and the strychnine alkaloids (Fraude, *Abstr.*, 1880, 69) does not take place when the acid is purified by conversion into the silver salt, or merely by the addition of a little hydrogen sulphide; the reaction is, however, produced when chlorine water or a persulphate is added to the purified acid. T. M. L.

Estimation of Oxygen in Commercial Copper. By MAURICE LUCAS (*Bull. Soc. Chim.*, 1900, [iii], 23, 900—904. Compare *Abstr.*, 1899, ii, 52).—Ten to twenty grams of the metal, contained in a porcelain boat, are covered with a sufficient amount of pure, finely divided tin to form an alloy containing about 20 per cent. of the latter metal, and heated at 900°, by means of an electric furnace, in a porcelain tube through which is passed a current of carbon monoxide free from oxygen and carbon dioxide. The carbon dioxide resulting from the combination of the oxygen contained in the copper with the carbon monoxide is collected and estimated just as in organic analysis. The addition of tin allows the operation to be carried out at a lower temperature than would be required if the copper were heated alone. In this process, arsenic and antimony are partly volatilised and condense in the colder part of the tube. A portion of the sulphur is converted into carbon oxysulphide, whilst nickel is volatilised as nickel carbonyl. N. L.

Irregular Distribution of Sulphur in Pig Iron. By RANDOLPH BOLLING (*J. Amer. Chem. Soc.*, 1900, 22, 798—799).—Attention is called to the irregular distribution of sulphur in pig iron. An instance is mentioned where the bottom of the mould contained 0.013 per cent. less sulphur than the top. To obtain a representative sample, it is necessary to drill a hole entirely through the sample pig and mix the drillings well before proceeding with the analysis. L. DE K.

Estimation of Sulphuric Acid in the Presence of Iron. IV. By FRIEDRICH W. KÜSTER and A. THIEL (*Zeit. anorg. Chem.*, 1900, 25, 319—322).—A polemical paper in answer to criticisms by T. W. Richards (*Abstr.*, 1900, ii, 472). E. C. R.

Estimation of Nitrogen in Saltpetre. By O. BÖTTCHER (*Chem. Centr.*, 1900, ii, 1161; from *J. Landw.*, 48, 287—289).—Von Wissell (*Abstr.*, 1900, ii, 685) obtained too low results by the method given by the author, who, however, has again obtained satisfactory results. Blank experiments will never differ to the extent of 0.25 c.c. of acid if pure chemicals and proper apparatus are used.

Zinc dust may be sufficiently freed from ammonia by treatment with water, but sodium hydroxide sometimes contains nitrates, or nitrites which are difficult to remove. L. DE K.

[Estimation of Nitrogen in Saltpetre.] By L. VON WISELL (*Chem. Centr.*, 1900, ii, 1161—1162; from *J. Landw.*, 48, 291—292).—A reply to Böttcher (preceding abstract). The author upholds his previous statement that Devarda's process is preferable to Böttcher's.

L. DE K.

The Bio-Chemical Arsenic Test. By G. MARPMANN (*Chem. Centr.*, 1900, ii, 1187; from *Pharm. Centr.-Halle*, 41, 666—672).—Ten grams of a mixture of equal parts of dry, powdered black and white bread are introduced into a 100 c.c. flask and thoroughly moistened with the suspected liquid. After closing the flask with cotton wool, the contents are sterilised by heating in steam; next day, the sterilisation is repeated, and when cold the mass is inoculated with *Penicillium brevicaulis* or an allied fungus. If arsenic is absent, an agreeable odour, resembling a beer-soup with bread, is noticed after some time, but, should there be arsenic, an odour of arsenic hydride is evolved; this may be diminished or even completely masked by the presence of certain compounds of phosphorus or sulphur, which yield evil smelling gases. An attempt to separate and identify the various gases was not satisfactory.

L. DE K.

Arsenic in Beer and Brewing Materials. By ALFRED C. CHAPMAN (*Analyst*, 1900, 26, 8—10), ALFRED H. ALLEN (*ibid.*, 10—13). REPORT OF THE COMMISSION TO THE MANCHESTER BREWERS' CENTRAL ASSOCIATION (*ibid.*, 13—15).—Beer has been found to contain arsenic owing to the use of arsenical brewing sugars. The arsenic contained in these materials was derived from arsenical sulphuric acid used in their manufacture. To detect the presence of arsenic in beer, the Manchester Committee gives the following instructions.

Two hundred c.c. of the beer are heated to boiling in a porcelain dish, 30 c.c. of pure, strong hydrochloric acid are added, and then a piece of pure, bright copper-foil, one-quarter by one-half inch in size, and the boiling is continued for 45 minutes. If, after that time, the copper remains bright, no arsenic is present. If a deposit has been formed, the foil is washed successively with water, alcohol, and ether, dried at 100°, and heated in a 2-inch reduction tube, the upper part of which should be warmed before the sublimation begins. If any sublimate is obtained, it must be examined under a magnifying power of 200 diameters. An arsenical sublimate shows well-defined octahedral or tetrahedral crystals.

Chapman and Allen operate in a similar manner, but the latter advises oxidising any sulphites that may be present by the addition of bromine water, a little cuprous chloride then being added to facilitate the reduction of the arsenic. If Marsh's test is employed, a little bromine water should be added to the beer to oxidise any sulphurous acid; the excess of bromine and the alcohol may then be removed by a few minutes boiling.

Brewing sugars are tested in a similar manner to beer.

L. DE K.

Estimation of Arsenic as Ammonium Magnesium Arsenate. By O. DUCRU (*Bull. Soc. Chim.*, 1900, [iii], 23, 904—910).—The author

has not obtained satisfactory results in the estimation of arsenic as the sulphide, and since all compounds of arsenic are readily converted into arsenic acid, whilst the transformation into arsenious acid is often difficult and incomplete, the estimation as ammonium magnesium arsenate is considered the most satisfactory of the methods in general use. The double arsenate should be dried to a constant weight by heating in the water-oven, this process taking at least 20 hours; irregular results are obtained if the salt is converted into magnesium pyroarsenate by ignition. The corrections usually given for the solubility of ammonium magnesium arsenate are too low. The results of a number of experiments are quoted to show that the arsenic contained in the washings is comparable in amount with that in the filtrate, and that the correction (1 milligram per 50 c.c.) must be applied to the combined liquids and not, as is usually the case, to the filtrate alone.

N. L.

Composition and Analysis of London Purple. By JOHN K. HAYWOOD (*J. Amer. Chem. Soc.*, 1900, 22, 800—809).—London purple is not, as hitherto believed, mainly composed of calcium arsenite and an organic dye, but the greater part of the arsenic is present as calcium arsenate; free soluble arsenious oxide is also nearly always present, and very often also free lime.

The analysis presents some difficulties on account of the colouring matter and the presence of the arsenic in both states of oxidation. To estimate the arsenic, the following process is adopted. Two grams of the sample are dissolved in about 80 c.c. of water and 20 c.c. of hydrochloric acid at 60—70°, and the filtrate and washings made up to 300 c.c. One hundred c.c. of this are treated in a 500 c.c. flask with sodium hydrogen carbonate in excess, and then diluted with water and a few drops of ether (to prevent frothing) to the mark. Two hundred and fifty c.c. are filtered off, mixed with starch solution, and titrated with standard iodine; this gives the arsenious oxide in 50 c.c. of the original solution.

Another 50 c.c. of the original solution are heated to 80° on the water-bath, then taken off and mixed with 3 grams of potassium iodide. After the lapse of 15 minutes, the iodine liberated by the arsenic acid is titrated with *N*/10 sodium thiosulphate. To properly observe the end point, the author proceeds as follows.

The sodium thiosulphate is run in slowly, and occasionally a drop of the solution is added to a drop of starch paste. When, finally, this only gives the faintest blue, a little starch paste is added to the whole of the solution and the colour dissipated with a few drops of thiosulphate. The solution is immediately made alkaline with solid sodium carbonate, hydrochloric acid added to slight acid reaction, and the whole again rendered alkaline with sodium hydrogen carbonate. Starch paste is now added and *N*/10 iodine run in until the blue colour appears; the end point is easily noticed by placing the beaker on a white surface between the eye and the light and adding the iodine until a distinct purple colour appears. This titration gives the total arsenic calculated as trioxide; by subtracting the result of the previous titration, the arsenic existing as pentoxide is obtained.

Methods are given for the estimation of soluble lime and soluble arsenious oxide and arsenic acid (compare Abstr., 1900, ii, 758), and analyses are given of five commercial samples of the article.

L. DE K.

Analysis of Commercial Metallic Silicon. By B. NEUMANN (*Chem. Zeit.*, 1900, 24, 869—870, 888—889).—The principal impurities contained in commercial silicon are iron, aluminium, calcium, and an insoluble residue consisting of iron silicide, silica, and silicon carbide. In the better class samples made in the electric furnace the silicon amounts to 93—97 per cent., whilst inferior samples contain only from 70—80 per cent.

One gram of the extremely finely powdered sample is treated with 100 c.c. of a 10 per cent. solution of sodium hydroxide contained in a silver dish covered with a watch glass, and heated on the water-bath until no more hydrogen is evolved. The insoluble matter contains all the impurities mentioned except a little aluminium which has dissolved in the soda. On treating it with hot hydrochloric acid, a residue is obtained containing the iron silicide, silicon carbide, and silica; this is then heated in a platinum crucible and weighed, and if desired it may be further tested. The solution contains iron and aluminium, which are precipitated by ammonia and afterwards redissolved in hydrochloric acid; the filtrate contains the calcium, and occasionally magnesium, which are then estimated as usual. The main alkaline solution, which contains also the bulk of the aluminium, is saturated with carbon dioxide, or, better still, acidified with hydrochloric acid, and precipitated while hot with ammonia. The precipitate, consisting of alumina with some silica, is put into a porcelain dish, the hydrochloric acid solution of the mixed iron and aluminium hydroxides is added, the whole evaporated after addition of sulphuric acid and heated to render the silica insoluble, and then boiled with dilute hydrochloric acid. The filtrate is divided into two equal parts; in one half, the iron is estimated volumetrically, and in the other half, the joint iron and aluminium is precipitated with ammonia.

The silicon is obtained by difference.

L. DE K.

Method for the Rapid Estimation of Carbon in Steel. By ROBERT JOB and CHARLES T. DAVIES (*J. Amer. Chem. Soc.*, 1900, 22, 791—797).—This is a simplification of Sargent's apparatus (Abstr., 1900, ii, 574), in which all the advantages are said to be retained. The separate, water-jacketed copper oxide tube may be entirely eliminated by simply increasing the length of the combustion furnace to 9 inches, increasing the length of the combustion tube to 20 inches, and inserting closely rolled copper gauze, about 4 inches in length and thoroughly oxidised prior to use, into the combustion tube exactly as in the old method, placing pieces of clay pipe stems between the copper oxide and the end of the tube so as to prevent the former from being forced out of place.

It was found that, as regards the furnace, three bunsen burners each about $2\frac{1}{4}$ inches apart, having spreaders upon the tops, give sufficient heat to keep the porcelain tube at bright redness over

8 inches of its length, a thin sheet iron being placed just beneath the tube as a protection from the direct action of the flame. Under these circumstances, the condensing worm is no longer necessary. The moist sand tube has been replaced by a U-tube containing anhydrous cupric sulphate and cuprous chloride, as recommended by Blair, inserting beyond it a small bubble tube containing 10 c.c. of a saturated solution of silver sulphate in sulphuric acid of sp. gr. 1.4. As regards the oxygen used in the combustion, the authors have had no difficulty in procuring a commercial article which was free from carbonaceous impurities, but if the quality is doubtful, a separate appliance may be avoided by simply passing a copper tube through the combustion furnace, utilising the heat of the three burners. An apparatus of this nature is readily attached to the furnace by boring two quarter-inch holes in each side of the furnace just above and slightly to one side of the spreaders of the bunsen burners, running a seamless copper tube of $\frac{1}{4}$ inch outside diameter entirely through the furnace, out through the end, and then, parallel to the first, back to the opposite end, the tube being in such a position that the flame will not play directly upon it, but still will heat it to redness. The ends of the tube, after passing through the furnace, are bent down to the level of the desk, and then extended along to the connection of the oxygen supply beyond the three-way cock. In this way, the ends of the copper tube remain cool, and may be connected with the rubber tubes without there being any necessity for a water-cooling arrangement.

Other minor modifications are described.

L. DE K.

Chemical and Calorimetric Analysis of Fuel. By HERMANN LANGBEIN (*Zeit. angew. Chem.*, 1900, 1227—1238, 1259—1272).—A lengthy paper containing a very large number of full analyses of wood, peat, lignite (brown coal), briquettes, coals, anthracite and coke; also paraffin oil, petroleum, benzenes, &c.

It is stated that the heating values of these substances is better obtained by direct experiment than by calculation from the elementary composition. The author prefers using a Kröcker's bomb, the crucible of which is lined with platinum foil instead of being enamelled. Full particulars are given as to the best methods of operation and calculation.

L. DE K.

Detection of Metals by the Absorption Spectra of their Compounds with Alkanna. II. Rare Metals. By JULIUS FORMÁNEK (*Zeit. anal. Chem.*, 1900, 39, 673—693).—Besides the metals enumerated in a former communication (*Abstr.*, 1900, ii, 687), the following (in the form of chlorides or nitrates) alter the absorption spectrum of alkanna: cerium, lanthanum, neodymium, praseodymium, yttrium, erbium, thorium, zirconium, titanium, vanadium, indium, molybdenum, (solution of chloride in absolute alcohol), palladium, rhodium, and (?) ytterbium. The addition of a trace of ammonia produces a more intense absorption, generally accompanied by a change in the position of the bands, except in the cases of erbium, thorium, zirconium, titanium, vanadium, indium, and molybdenum, in which ammonia causes no change. An excess of ammonia usually causes

turbidity and again alters the spectrum. The spectrum generally consists of three bands, that nearest the red end being the strongest. The nitrates give spectra similar to, but not identical with, those of the chlorides. If a mere trace of the metallic salt is added, a spectrum is obtained with its bands in a different position and of different relative intensities. The spectra produced by the different metals are in no cases identical, but they are of little service for the detection of the metals when mixed, since their position is somewhat dependent on concentration, and the bands of one often overlap another.

Many interesting relations are noticeable between the wave-length of the principal absorption band and the position in the periodic system of the metal producing it.

M. J. S.

Analysis of Mixtures of Two Salts. By LUDWIG W. WINKLER (*Chem. Zeit.*, 1900, 24, 816).—To facilitate the analysis of two soluble salts by indirect analysis such as by titration with standard acid or standard silver solution, it is recommended to weigh such a quantity of the saline mixture that the excess of the volumetric reagent will at once show the percentage of the admixture.

The amount to be used in the test is represented by the equation $a = 100 : (1/e' - 1/e)$ in which e' represents the milligram equivalent weight of the admixture and e that of the chief constituent. For instance, to determine the amount of sodium carbonate in potassium carbonate, 2.279 grams of the mixture are titrated with *N* hydrochloric acid; every c.c. required in excess of 32.96 c.c. represents 10 per cent. of sodium carbonate.

L. DE K.

Determination of Unburnt and Overburnt Gypsum in the Plaster of Paris from the Kilns. By L. PÉRIN (*Compt. rend.*, 1900, 131, 950—952).—Plaster of paris as it comes from the kilns consists of natural gypsum which has escaped the action of the heat, gypsum which has become anhydrous on account of overheating, gypsum which has only lost part of its water and constitutes the active matter, and finally a proportion of other inert matter, silica, calcium and magnesium oxides, and ferric oxide and alumina. It is a well-known fact that the resistance of the plaster towards pulling, crushing, and bending is in inverse proportion to the inert matter which it contains. The following process is given by the author for the estimation of the unburnt and overburnt gypsum; the other constituents are determined by the ordinary methods.

The sample is powdered in an agate mortar, dried for two hours in an air-bath at 60°, and cooled in a desiccator. Five grams of the powder are then put into a tared porcelain or platinum dish and mixed with a slight excess of water to re-form gypsum; the mass is again dried at 60° to constant weight, and the quantity of water (A) which has combined with the active matter is thus found. Assuming that this active matter consists of $\text{CaSO}_4 \cdot \text{H}_2\text{O}$, the total active matter (x) will be represented by $8.56 A$.

Estimation of the Unburnt Gypsum.—The mass is now heated to redness and the loss in weight minus A represents the water (B) in combination with the unburnt gypsum. As this consists of $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$, its weight (y) will be represented by $4.8 B$.

Estimation of the Overburnt Gypsum.—If a represents the sulphur trioxide corresponding with x , b the same corresponding with y and Q the total sulphur trioxide contained in the sample, then the trioxide corresponding with the overburnt gypsum (z) will be $q Q - (a + b)$ and as 80 parts of sulphur trioxide correspond with 136 parts of calcium sulphate, z will be represented by $1.7 q$.
L. DE K.

Methods for the Valuation of Materials for Improving Calcareous Soils and the Estimation of Readily Soluble Alkaline Earths and their Carbonates in Soils. By HEINRICH IMMENDORFF (*Zeit. angew. Chem.*, 1900, 1177—1184).—As the result of a large number of experiments, the author concludes that the calcium in calcareous soil improvers is best estimated volumetrically by means of standard acid and alkali; the results are satisfactory and the operation takes but little time. The same process also gives trustworthy results in the analyses of soils which are rich in calcium (or magnesium) carbonate. If the soils contain only a little calcium carbonate, the method becomes unsuitable when the object is not to estimate the readily soluble alkaline earths but only the carbonates, but the estimation of the alkalinity serves very well for the purpose of estimating readily soluble alkaline earths in the absence of carbonates.

As regards the estimation of calcium carbonate in soils by a carbon dioxide estimation, it is observed that the ordinary method may lead to grave errors when dealing with soils free from, or poor in, calcium carbonate. If a sample contains humus matters, heating during the estimation must be carefully avoided. The small quantity of carbon dioxide yielded by the humus does not affect the result when dealing with soils rich in carbonates. The author finally states that Stützer and Hartleb's ammonium chloride method (*Abstr.*, 1899, ii, 521) is untrustworthy when dealing with soils poor in calcium carbonate.

L. DE K.

Estimation of Lead in Cupriferous Minerals with Calcareous Gangue. By GEORGES GUEROUT (*Chem. Centr.*, 1900, ii, 1163; from *Ann. Chim. anal. appl.*, 5, 372—373).—The sample is dissolved in nitric acid and electrolysed according to Riche's directions. The copper which separates at the negative pole is weighed. The lead (as dioxide) at the positive pole is dissolved in nitric acid with addition of sugar, or in hydrochloric acid and then evaporated with sulphuric acid to obtain the lead as sulphate.

L. DE K.

Thiocyanates of Copper and Silver in Gravimetric Analysis. By R. G. VAN NAME (*Amer. J. Sci.*, 1900, [iv], 10, 451—457).—Copper thiocyanate has been supposed to retain 1.54 to 3 per cent. of water even after drying at 115° and, therefore, not to be well adapted for direct weighing. The author, however, finds that when collected on asbestos in a weighed crucible, it becomes perfectly anhydrous by drying for 2 or 3 hours at 110° . To ensure complete precipitation of the copper, the liquid should be precipitated with a fair excess of ammonium thiocyanate in the presence of ammonium hydrogen sulphite, and left for about 20 hours, unless there is practically no free acid, when a few hours suffice.

Silver cannot be precipitated as thiocyanate as the precipitate is soluble in excess of the reagent. On the other hand, thiocyanic acid may be conveniently precipitated with silver nitrate. After collecting the precipitate on an asbestos filter and drying at 115° , it becomes anhydrous and fit for direct weighing.

L. DE K.

Estimation of Mercury in Ammoniated Mercury and other Mercury Compounds. By C. T. BENNETT (*Pharm. J.*, 1900, [iv], 11, 575—576).—A solution of the mercury compound in water or dilute hydrochloric acid is treated with hypophosphorous acid (30 per cent.); reduction at once takes place with formation of a greyish-black precipitate of metallic mercury which, on warming, collects into a globule; the supernatant liquid is decanted on to a filter, which collects any small particles of mercury floating on the surface; the mercury is washed with warm water, dried at 100° , and weighed.

E. G.

Impregnation and Analysis of Antiseptic Dressing Materials. By F. Utz (*Chem. Centr.*, 1900, ii, 1181—1182; from *Pharm. Zeit.*, 45, 840—842).—The author (compare *Abstr.*, 1900, ii, 762) reviews and criticises fourteen methods given for the estimation of corrosive sublimate in dressing materials. *Dressing materials containing iodoform.* After mentioning the processes of Greshoff, Lehmann, and Huss, the following method is recommended. The material is treated with alcoholic potash, the solution acidified with acetic or nitric acid, again neutralised with magnesium carbonate, and the iodine estimated either gravimetrically or volumetrically with silver nitrate. *Materials containing carbolic acid.* The phenol is converted into the tribromocompound, which is dried at 80° and weighed; or the phenol is estimated volumetrically according to Beckurts' process, or Vortmann's method. *Materials containing salicylic acid.* Five grams are extracted with pure ether free from acid and the ether residue is dried at 50 — 60° and weighed, or the material is extracted with alcohol and the solution titrated with *N*/10 potash and phenolphthalein. Equally accurate, although more complicated, is the iodometric process. One gram of the material is digested for half an hour in 100 c.c. of water, and 25 c.c. of the solution are treated in a glass-stoppered bottle with 100 c.c. of bromine solution (1.666 grams of potassium bromate and 5.939 grams of potassium bromide in 1000 c.c.) and 5 c.c. of strong sulphuric acid, and thoroughly shaken; after 15 minutes, 10 c.c. of a 10 per cent. solution of potassium iodide are added, and the liberated iodine titrated in the usual manner. *Materials containing boric acid.* Five grams of the cut up material are extracted in a 250 c.c. flask with 200 c.c. of a mixture of 1 part of glycerol and 19 parts of water, and the mixture is diluted to the mark with dilute glycerol of the same concentration. Fifty c.c. of the clear liquid are mixed with a sufficiency of glycerol, and titrated with *N*/10 potash, with phenolphthalein as indicator.

L. DE K.

Estimation of Manganese and Cobalt as Phosphates. By HENRY DRYSDALE DAKIN (*Zeit. anal. Chem.*, 1900, 39, 784—790).—The method employed by the author for the estimation of zinc as phos-

phate (Abstr., 1900, ii, 624) is equally serviceable for manganese and cobalt. The addition of ammonium chloride is not necessary, but it is desirable to nearly neutralise with ammonia any large excess of free acid that may be present, and to add at least 10 parts of ammonium phosphate for 1 part of the metal to be estimated. The amorphous phosphate, which is precipitated, changes into the crystalline, double ammonium phosphate during the 10—15 minutes heating; filtration may be commenced at any time after cooling for half an hour. The precipitate is washed with a hot 1 per cent. solution of ammonium phosphate, and then with dilute alcohol. After 2 hours drying at 100—105°, its weight becomes constant, and corresponds in each case with the formula $M''NH_4PO_4 \cdot H_2O$. Ignition with free access of air reduces the precipitate to pyrophosphate. Results of equal accuracy were obtained whether the precipitate was weighed in the one form or the other.

M. J. S.

Estimation of Iron in "Ferrum Oxydatum Saccharatum" containing a large Percentage of Iron. By WILHELM GÖHLICH (*Chem. Centr.*, 1900, ii, 1162—1163; from *Pharm. Zeit.*, 45, 815—816).—Two grams of the sample are mixed with an equal quantity of dry sodium carbonate, and the mixture ignited in a small platinum dish. The residual ferric oxide is then dissolved in hydrochloric acid, mixed with potassium iodide, and the liberated iodine titrated with standard sodium hydrogen sulphite.

The sample may, however, be tested with equally satisfactory results by the German official process for the estimation of iron in the 3 per cent. drug.

L. DE K.

Estimation of Iron in Magnetite Ore by the Specific Gravity Test. By JOSEPH W. RICHARDS (*J. Amer. Chem. Soc.*, 1900, 22, 797—798).—Many magnetite ores are simply mixtures of magnetite and quartz. A table is given showing the percentage of ferrosiferous oxide (or iron) and silica in magnetite with the corresponding specific gravity of the sample.

The specific gravity may be taken at the mine when a suitable pair of scales is at disposal; the inaccuracy caused by the use of a rough scale is compensated by the large quantity of ore (from 1 to 50 pounds) used in the experiment. The results are correct within a few per cent., and quite accurate enough for the purpose of grading.

L. DE K.

Iodometric Estimation of Chromic Acid. By KARL SEUBERT and A. HENKE (*Zeit. angew. Chem.*, 1900, 1147—1154).—After some introductory remarks by the first author, the article is devoted to "The action of potassium dichromate on potassium iodide in the presence of sulphuric acid." Tables and curves are given showing the influence of dilution, time of action, excess of acid, excess of either potassium iodide or dichromate, &c., on the amount of iodine liberated. The experiments were conducted by measuring the solution of the dichromate, then adding, first, the calculated volumes of water and solution of potassium iodide, and finally a definite amount of acid; this was then regarded as the starting point of the experiment. To obtain accurate results in the iodometric analysis of chromic acid, care

should be taken to add about 18 mols. of potassium iodide and 70—110 mols. of sulphuric acid (previously diluted) for 1 mol. of potassium dichromate. After a few minutes' action in a closed flask, the mixture is largely diluted with water to get rid of the green colour due to chromic sulphate, and the liberated iodine is then titrated with *N*/10 sodium thiosulphate, using starch as indicator. Any unavoidable excess of thiosulphate is in turn titrated with *N*/100 iodine.

L. DE K.

Estimation of Gold and Silver in Pyrites. By WILHELM BUDDËUS (*Chem. Zeit.*, 1900, 24, 922—923).—The usual process of scorifying with lead and cupelling the lead regulus does not give concordant results, and a not inconsiderable portion of the precious metals is retained by the slags. The following process is easier of execution and appears to give thoroughly trustworthy results.

One hundred to two hundred grams of the powdered sample are put into a Chamotte crucible of 70—140 c.c. capacity, the crucible is covered with a lid and heated for half or three-quarters of an hour in a muffle until a sulphur flame is no longer noticed. When cold, the contents are transferred to a beaker or casserole of 1—2 litres capacity and treated with 250—500 c.c. of hydrochloric acid (1:1) to dissolve the iron sulphide. The insoluble matter which, besides siliceous matter, contains all the gold and silver, is well washed, dried, and fused in a covered Hessian crucible with 50—100 grams of assay lead and 5—10 grams of dry borax; instead of the assay lead, 100—200 grams of a mixture of dry lead acetate and sodium carbonate may be used. The resulting lead regulus is then cupelled and the gold-silver button parted as usual.

L. DE K.

Estimation of Gold and Silver in Pyrites. By J. LOEVY (*Chem. Zeit.*, 1900, 24, 1114—1115).—The author criticises Buddëus' process (preceding abstract).

L. DE K.

Estimation of Calcium in Water. By GASSELIN (*J. Pharm.*, 1900, [vi], 12, 556—559).—Fifty c.c. of a *N*/100 solution of oxalic acid and two drops of a solution of ammonia are added to 50 c.c. of the water to be analysed. The mixture is then violently agitated, and after 10 minutes is filtered, and the amount of oxalic acid in the filtrate estimated by titration with *N*/100 potassium permanganate.

H. R. LE S.

Estimation of the Hardness of Water. By GIULIO MORGUO (*Chem. Centr.*, 1900, ii, 1186—1187; from *Giorn. Farm. Chim.*, 50, 440—445).—The author estimates the temporary hardness by titration with *N*/10 hydrochloric acid using methyl-orange as indicator; this neutralises any soluble carbonates. The permanent hardness is estimated by boiling the water with a known quantity of sodium carbonate, which causes the precipitation of the alkaline earths as carbonates; the excess of the alkali is then titrated in the filtrate.

L. DE K.

Action of Sodium *p*-Diazobenzenesulphonate on Iron Cystinate in Contaminated Water. By HENRI CAUSSE (*Compt. rend.*, 1900, 131, 1220—1222. Compare Abstr., 1900, ii, 457—458).—In

answer to Molinié's criticism of the author's test for cystine (this vol., ii, 42), further experiments were made which indicate that the presence of iron is essential to the formation of the orange coloration with sodium *p*-diazobenzenesulphonate. A contaminated water containing a considerable amount of cystine ceases to give the reaction after treatment with baryta water; the precipitate formed by this reagent retains all the iron cystinate, for on extraction with dilute potassium hydroxide solution a filtrate is obtained which, when rendered acid, develops the orange coloration. The cystinate is not decomposed by normal or basic lead acetate, for the precipitates produced by these reagents yield no cystine on extraction with dilute potash solution. Molinié's experiments on the production of the coloration with distilled water are not conclusive, for if the water placed in the distilling apparatus contained ferrous cystinate this substance would be found in the distillate, unless the distillation was performed in the presence of barium hydroxide. Phenol, catechol, and resorcinol, when treated with the diazosulphonate in the presence of traces of ferrous salts, also develop characteristic orange colorations.

The reaction is indicative of certain groupings rather than of a definite substance, for the orange coloration not destroyed by sulphurous acid is produced whenever water contains ferrous compounds containing the CSH or COS groups.

G. T. M.

Detection of Foreign Colouring Matter in Spirits. By CHARLES A. CRAMPTON and F. D. SIMONS (*J. Amer. Chem. Soc.*, 1900, 22, 810—813. Compare Abstr., 1899, ii, 530).—Fifty c.c. of the sample are evaporated on the water-bath nearly to dryness; the residue is washed into a 50 c.c. glass-stoppered flask, 25 c.c. of absolute alcohol are added, and when cold the liquid is diluted with water to the mark. After mixing, 25 c.c. of the solution are transferred to an ordinary globe-shaped separating funnel or flask with its stem above the stopcock expanded into a bulb the capacity of which up to a mark on the stem is 25 c.c.; the upper bulb should have a capacity of about 100 c.c. Fifty c.c. of ether are added, and the whole shaken at intervals for half an hour; when the layers have properly separated, the lower one is made up with water to the original 25 c.c. volume, which may be conveniently done by connecting the lower end of the apparatus with a rubber tube which carries water from an elevated flask, the inflow being regulated by the stopcock. The whole is again shaken, and the aqueous layer, after separation, is drawn off and compared in a tintometer with 25 c.c. of the liquid which has not been extracted with ether; from the difference in the two readings the percentage of colour soluble in ether is calculated. This consists chiefly of the colouring matter of oak wood. Genuine spirits yield 40—50 per cent. of their colour to ether, whilst spirits coloured by caramel or prune juice alone are not affected.

L. DE K.

Estimation of Dextrose and Dextrin in Commercial Glucose. By LÉON LINDET (*Bull. Soc. Chim.*, 1901, [iii], 25, 91—93).—The process described is based on (1), the estimation of the total carbon by combustion with cupric oxide in the usual manner; (2), the determination of the rotatory power. From the first of these two data, the

combined weight of the carbohydrates, calculated as $C_6H_{12}O_6$, is obtained, and from this, together with the rotatory power, the relative proportions of dextrose and dextrin are calculated. N. L.

Neumann's Modification of Fischer's Phenylhydrazine Test for the Detection of Sugar in Urine. By OTTO MARGULIES (*Chem. Centr.*, 1900, ii, 1188—1189; from *Berl. Klin. Woch.*, 37, 881—884).—The author has investigated this process (Abstr., 1900, ii, 248), and thinks it a very delicate one. Whilst the copper and bismuth tests no longer show sugar in urine when it falls to 0.05 per cent., the phenylhydrazine test distinctly shows the presence of 0.02 per cent. of sugar. Small quantities of albumin do not interfere, but large amounts of urates render the test less delicate. When the urine is very rich in phosphates, the test also becomes uncertain, unless the sugar is present to the extent of at least 0.5 per cent. L. DE K.

Estimation of Glycogen by the Pflüger-Nerking Method. By ERNST SALKOWSKI (*Pflüger's Archiv*, 1900, 82, 521—527). By EDUARD PFLÜGER (*ibid.*, 528—537).—Polemical articles chiefly directed to the question whether the former author has correctly described the method in his text-book. W. D. H.

Estimation of Tartaric Acid in Presence of Oxalic Acid. By M. PALLADINI (*Gazzetta*, 1900, 30, ii, 446—453).—On neutralising, by means of sodium hydroxide solution, a solution containing tartaric, oxalic, and citric acids in quantities proportional to their molecular weights, and adding calcium chloride, the precipitate obtained contains the oxalic acid and part of the tartaric acid as calcium salts, the solubility of the calcium tartrate being increased by the presence of sodium chloride. If acetic acid is added before the calcium chloride, the precipitated oxalate is found to contain a considerable proportion of tartrate, which cannot be removed even on heating the precipitate in a sealed tube with a large excess of glacial acetic acid. Silver nitrate precipitates oxalic acid but not tartaric acid from dilute solutions; if both acids are present, the precipitate consists of a mixture of the two salts. T. H. P.

Detection of "Saccharin" (*o*-Benzoicsulphinide) in Wine and Beer Free from Salicylic Acid. By F. WIRTHLE (*Chem. Zeit.*, 1900, 24, 1035).—To test for "saccharin" in wines which do not contain salicylic acid, 100—200 c.c. of the sample are evaporated to about 20 c.c. This is transferred to a separating funnel, the basin is rinsed with water containing a few drops of aqueous sodium hydroxide, and the whole strongly acidified with sulphuric acid. The liquid is shaken thrice in succession with 50 c.c. of ether, which is then filtered into an Erlenmeyer flask and after adding 10 c.c. of 0.5 per cent. aqueous sodium hydroxide and shaking, the ether is distilled off. The residue is evaporated in a small porcelain dish, 1 gram of solid sodium hydroxide is added, and the dish heated slowly in an air-bath to 215°; the heating is then continued for a quarter of an hour at 210—220°. The fused mass, when cold, is dissolved in warm water, acidified with sulphuric acid, and shaken with the usual mixture of

ether and light petroleum. The residue left on evaporation is dissolved in a few c.c. of water and tested with ferric chloride for salicylic acid, the presence of which is a proof of the presence of "saccharin." A very fine violet colour is obtained even if the 100 c.c. of the sample contain only 0.001 gram of saccharin. In the absence of this substance, there may be occasionally a dirty yellowish-red colour due to tannin compounds, but never a violet. When the process is applied to beers, a faint violet colour is occasionally obtained, even when the sample contains no "saccharin"; this is caused by the action of the alkali on the hop-tannins, traces of which pass into the ether; it may, however, be avoided by first adding to 100 c.c. of the sample a few c.c. of a saturated solution of copper acetate, followed by a solution of disodium hydrogen phosphate; the filtrate is then evaporated and treated as directed. Pure beer will then, at the worst, only cause a faint rose coloration.

L. DE K.

Apparatus for the Extraction of Liquids by Ether or Chloroform. By W. A. OSBORNE (*Proc. Physiol. Soc.*, 1900, ix—x).—Modifications of Soxhlet's apparatus are described and figured.

W. D. H.

Characters of Oil of Akee. By W. GARSEED (*Pharm. J.*, 1900, [iv], 11, 691—692).—Oil of akee, obtained by expression from the arillus of the fruit of the akee tree (*Blighia sapida*), is a yellow, non-drying fat, partly liquid, and partly solid and granular; it melts at 25—35°, and begins to resolidify at about 20°. The following constants were determined, and compared with the corresponding characters of palm oil and olive oil. Sp. gr., 0.857 at 100°/15.5°; Hehner number, 93; saponification number, 194.6; Reichert number, 0.9; iodine number, 49.1; acid number, 20.1. The mixed fatty acids distil without decomposition at 220—225° under 13 mm. pressure, melt at 42—46°, and resolidify at 40—38°; their saponification number is 207.7, and their iodine number, 58.4. A partial separation of the acids was effected by means of their lead salts; the salt which is soluble in ether appears to yield oleic acid, whilst the insoluble salt furnishes a white, crystalline powder; the latter acid may be a mixture of palmitic and stearic acids, or, more probably, a homologue of these acids.

E. G.

Cedar-nut Oil. By LEO VON SCHMOELLING (*Chem. Zeit.*, 1900, 24, 815).—Specific gravity, 0.930; rise of temperature with sulphuric acid, 98°; Hehner number, 91.97; saponification number, 191.8; iodine number of the oil, 159.2, and that of the fatty acids, 161.3; acid number, 3.25, that of the fatty acids, 193; glycerol, 10.31 per cent.; volatile fatty acids, 3.77 per cent.; free fatty acids, 1.6 per cent.; total fatty acids, 95.74 per cent.; average molecular weight of the oil, 280, that of the acids, 290; acetyl number of the fatty acids, after 6 days treatment in a closed flask, 81.9; liquid fatty acids, 87 per cent.; unsaponifiable matter, 1.3 per cent.; solidifying point of fatty acids, 11.3°. From the high iodine figure of the liquid fatty acids (184), it follows that these consist mainly of linoleic acid, with but very little linolenic and oleic acids.

Kryloff, who examined the oil in 1898, found: Hehner number

93.33; saponification number, 191.8; iodine number, 149.5—150.5; acid number, 1.09; free fatty acids, 2.0 per cent. Kryloff's statement that, on keeping, a crystalline deposit of palmitic acid is obtained is confirmed by the author. The author proposes to investigate Kryloff's statement as to the oxidation products of the fatty acids.

In conclusion, it is stated that the oil cannot be used as a substitute for linseed oil. L. DE K.

Estimation of Fat in Creams. By C. H. ECKLES (*Chem. Centr.*, 1900, ii, 1165—1166; from *Bull. Iowa Agricultural College Expt. Station Ames*, 52, 31—42).—The author states that the fat in creams may be estimated by the Babcock method, if they are first suitably diluted with water. When fresh, this may be done by measuring; but if the sample contains air-bubbles, or if it has become sour, it should be weighed. On account of the great viscosity, it is best to rinse the pipette with warm water. Owing to the diminished sp. gr., a correction must afterwards be made as follows. If the fat amounts to 10—12 per cent., 0.1 should be added; for 13—14, 0.2; for 15—17, 0.3; for 18—20, 0.4; for 21—23, 0.5; for 24, 0.6; for 25, 0.7; for 26—27, 0.8; for 28—29, 0.9; for 30, 1.0; for 31, 1.1; for 32—33, 1.2; for 35, 1.4; for 36, 1.5; for 37, 1.6; for 38, 1.7, and for 40, 1.8 per cent. extra fat. The percentages of fat obtained by weight and measure then practically agree. L. DE K.

Agreement between Milk Solids actually determined and those found by Calculation. By GOTTWALT AMBÜHL (*Chem. Zeit.*, 1900, 24, 871—872).—From the result of 116 experiments, it is again shown that there is a close relation between the milk solids obtained gravimetrically and those ascertained by calculation from the specific gravity and the fat. The presence of fat in very small or very large quantity does not affect this relationship.

In the author's experiments, the fat has been estimated by means of Gerber's acidobutyrometer, and for the calculation of the solids, Fleischmann's formula has been used.

Reinsch and Lührig (*Abstr.*, 1900, ii, 771) have stated that the result of the direct estimation of the solids is untrustworthy unless the milk is quite fresh; the author has tested several milks from one to two days old with equally satisfactory results. L. DE K.

The Reichert-Meissl Number of Dutch Dairy Butter. By WILHELM KIRCHNER and R. RACINE (*Zeit. angew. Chem.*, 1900, 1238).—The authors having tested a large number of samples of undoubtedly genuine butter from dairies in Holland, state that, particularly in the spring and the autumn, the Reichert-Meissl number may be as low as 21.8—22.1. They observe that the samples were not prepared from the milk of only a few cows, but in their presence, from a very large quantity of mixed milk. L. DE K.

Action of Sodium Ethoxide on Fats. By HENRIK BULL (*Chem. Zeit.*, 1900, 24, 814—815, 845—847. Compare *Abstr.*, 1900, ii, 250).—*Volumetric Estimation of Water in Alcohol.*—If a solution of sodium ethoxide in absolute alcohol is boiled with a fat free from acidity, no saponification takes place. If, however, water is present,

this decomposes the sodium ethoxide with formation of sodium hydroxide and a partial saponification takes place; from the amount of alkali consumed, the amount of water may be calculated. To make the experiment, normal sodium ethoxide is required, which is standardised by warming 10 c.c. with 5 c.c. of medicinal cod-liver oil in a reflux apparatus for half an hour; after boiling for 15 minutes, it is allowed to cool, mixed with 20 c.c. of ether, and titrated with $N/2$ hydrochloric acid, using phenolphthalein as indicator. When the experiment is now repeated with the addition of a known volume of a weaker alcohol, less acid will be required in the titration, and the difference multiplied by 0.009 represents the volume of water.

Estimation of Glycerol in Fats.—Three grams of the sample are heated on the water-bath in a 50 c.c. narrow, stoppered tube with 3 c.c. of $2N$ sodium ethoxide at 70° for 30 minutes. After cooling for half an hour in the air, 25 c.c. of ether are added, the whole is well shaken, and then diluted with ether to the mark. When the supernatant liquid is quite clear, 25 c.c. are pipetted off, diluted with 10 c.c. of alcohol and titrated with $N/2$ hydrochloric acid and phenolphthalein until the reddish colour has disappeared; no notice should be taken of any brownish colour. The remaining liquid in the tube is similarly titrated, but with this difference, that 5 c.c. of acid must be added all at once. The amount of glycerol is found by multiplying the difference in the titrations by 0.0092. The author admits that there is sometimes a great difficulty in noticing the end-reaction; perhaps a more suitable indicator may be found.

Preparation of dry alcohol.—The amount of water in a commercial sample of absolute alcohol is first estimated by the process described, a large quantity is then mixed with the necessary amount of metallic sodium and a little oil, and submitted to distillation. L. DE K.

Analysis of Bone-Fat. By H. MENNICKE (*Chem. Zeit.*, 1900, 24, 917—918, 923—924).—*Estimation of water.*—Five grams of the well mixed sample are dried at 105° in a flat nickel or glass dish to constant weight; this is generally attained after 6 hours. It must be remembered that the fat always contains a little benzene, which has been used in its manufacture, so that the water found will be slightly in excess of the truth. *Foreign admixtures.*—These consist mostly of inorganic constituents, lime soaps, and dirt. The lime soaps are, however, more or less soluble in any of the usual fat solvents, so that the results of the fat estimation may be as much as 10 per cent. too high. The author, however, is of opinion that from a technical point of view the lime soaps are not really impurities, although the calcium oxide contained therein must be considered as such. From this it follows that for the technical extraction of the bones, carbon tetrachloride would be the best solvent, although benzene offers other advantages. *Ash.*—The previously dried sample is burnt in a weighed platinum crucible; the ash should not exceed 10 per cent., and it may be further tested if desired. *Estimation of fat.*—Carbon tetrachloride or chloroform is used as the solvent, and the weighed fat is then burnt and any ash allowed for. The results are sufficiently accurate for technical purposes. The process given by Shukoff and Schestakoff (*Abstr.*,

1899, ii, 191) may also be used. The estimation of fat in bones, particularly extracted bones, presents some difficulties, as the amount obtained depends on the nature of the solvent; benzene is perhaps the most suitable one. *Detection of foreign fats*.—Leather grease, horse fat, and neatsfoot oil are notoriously added. Their detection presents serious difficulties, but gross adulterations may be safeguarded against by the determination of the iodine number. Genuine bone-fat gives an average iodine number of 53; that of the substitutes is generally much higher.

L. DE K.

Testing of Bees Wax. By J. WERDER (*Chem. Zeit.*, 1900, 24, 967—968).—When 5 grams of the sample are used for the saponification test, it is necessary to boil for an hour and a quarter; this is best done in an Erlenmeyer flask placed on wire-gauze and heated over a rose-burner. Pure wax always yields a clear solution, which remains clear for a long time on adding excess of boiling water; paraffin and ceresin, if present, form a layer on the top. If the saponified wax is dried with sand and then extracted with ether in a Soxhlet apparatus, it yields from 48.55 to 53.08 per cent. of unsaponifiable matters. Samples which yield a very much larger extract may, therefore, be suspected to contain paraffin.

L. DE K.

Analysis of Wax. By KARL DIETERICH (*Chem. Zeit.*, 1900, 24, 995).—The author agrees with Werder (preceding abstract) that although 20 c.c. of $N/2$ alcoholic potash are theoretically sufficient for the saponification of 5 grams of wax, it is absolutely necessary to extend the time of boiling to an hour and a quarter. If, however, 3 grams only of the sample are taken, the saponification is quite complete in half an hour.

L. DE K.

Rapid Method for the Detection of Aniline-orange in Milk. By HERMANN C. LYTGOE (*J. Amer. Chem. Soc.*, 1900, 22, 813—814).—About 15 c.c. of milk are placed in a porcelain casserole and the same quantity of hydrochloric acid of sp. gr. 1.20 is added, while gently shaking the vessel to cause thorough mixing and break up the curd into coarse lumps. If the sample contains aniline-orange, the curd will be coloured pink, but if not, it will be white or yellowish.

The same solution may now be tested for formaldehyde, by adding a drop of ferric chloride and boiling. A solution containing 5 c.c. of a 10 per cent. solution of ferric chloride to 2 litres of hydrochloric acid may also be used when testing for aniline-orange; this renders further addition of ferric chloride unnecessary when afterwards testing for formaldehyde.

L. DE K.

New Form of Urinometer. By ANDRÉ JOB (*J. Pharm.*, 1900 [vi], 12, 417—420).—The decomposition of the urine by sodium hypobromite is effected in a closed flask of known capacity, and the increase of pressure produced by the evolved nitrogen is measured by means of a manometer which is fused to the neck of the flask. From this increase of pressure, the weight of evolved nitrogen, and, consequently, the percentage of urea in the urine, is readily calculated.

H. R. LE S.

Estimation of Urea. By AL. BRAUNSTEIN (*Zeit. physiol. Chem.*, 1900, 31, 381—388).—It is shown that in the presence of hippuric acid the Mörner-Sjoquist method of estimating urea is not applicable. Correct results are obtained if, after the evaporation of the ether and alcohol and addition of magnesia, crystalline phosphoric acid is added and heated with the mixture at 140—145° for 4½ hours. Hippuric acid is not decomposed by such treatment, and after the addition of potash the ammonia formed from the urea can be distilled off and estimated.
W. D. H.

Quantitative Estimation of Morphine by Reduction with Silver Nitrate. By C. REICHARD (*Chem. Zeit.*, 1900, 24, 1061—1062).—The author has found that a moderately concentrated solution of morphine sulphate, when warmed with an excess of silver nitrate, causes a precipitate of metallic silver in the proportion of 2 atoms of the metal for 1 mol. of the alkaloid. The silver is collected on a filter, washed, and finally ignited in a weighed porcelain crucible.

As most of the other alkaloids do not readily reduce silver nitrate, the method is suitable for estimating the amount of morphine in an alkaloidal mixture. If the morphine salt should contain acids which are precipitated by silver nitrate, such as hydrochloric, hydrobromic, or hydriodic acids, the precipitated silver should be washed with ammonia, or a solution of sodium thiosulphate.
L. DE K.

Assay of Nux Vomica. By F. C. J. BIRD (*Pharm. J.*, 1900, [iv], 11, 574—575. Compare Farr and Wright, *Abstr.*, 1900, ii, 778).—The alkaloids of *Nux vomica* seeds may be readily extracted by the maceration-pressure method with a solvent composed of amyl alcohol (1 vol.), chloroform (3 vols.), and ether (4 vols.); the strychnine and brucine are then separated as ferrocyanides by a modification of Farr and Wright's method. It is immaterial whether 5 or 10 c.c. of the liquid extract are assayed, or if the time allowed for the precipitation of the strychnine ferrocyanide is 2 or 6 hours.
E. G.

Methods of Estimating Proteid Nitrogen in Vegetable Matter. By G. S. FRAPS and J. A. BIZZELL (*J. Amer. Chem. Soc.*, 1900, 22, 709—717).—Stutzer's method of precipitating the proteids by means of copper hydroxide is open to fewer objections than other processes.

Bromine is not a suitable precipitant for proteids in vegetable materials (compare *Abstr.*, 1898, ii, 320). Extraction with hot water does not always give concordant results. Phosphotungstic acid at 60° precipitates about the same amount of nitrogen as copper hydroxide, but at 90° or 100° the precipitation is incomplete.

L. DE K. 49

General and Physical Chemistry.

Refractivity of the Inactive Gases. By WILLIAM RAMSAY (*Arch. néerland sci. exact. nat.*, 1900, [ii], 5, 356—359).—The refractivities were compared with air or hydrogen by means of the apparatus described by Lord Rayleigh (*Proc. Roy. Soc.*, 59, 203; Abstr., 1896, ii, 598). The results for the value of $\mu - 1$ compared with air are: helium, 0.1238; neon, 0.2345; argon, 0.968; krypton, 1.449; xenon, 2.364. By division by the density these values become respectively 0.0309, 0.0172, 0.0242, 0.0177, 0.0184; neon, krypton, and xenon yield almost the same number, which is considerably less than those for argon and helium. It is noticeable that the first and third element in other series (halogens or alkalis) give similarly a higher value than the other members.

L. M. J.

Indices of Refraction of Solutions of Calcium Chloride. By GUSTAV J. W. BREMER (*Arch. néerland sci. exact. nat.*, 1900, [ii], 5, 202—213).—By means of a spectrometer, the indices of refraction were measured in the case of various solutions of calcium chloride for the hydrogen lines H_α , H_β , H_γ , and for the sodium line, the value for infinite wave-length being also calculated. The solutions varied in concentration from 19.6 to 7.0 per cent., but the results are not strictly comparable, as the temperatures varied from 13° to 20°. The refractive power was calculated by the Lorenz formula and found to differ but little from that of pure water; it appears to decrease slightly as the concentration increases. The indices of refraction are greater than that of water, and the difference, which increases slightly with the refrangibility of the light, is approximately proportional to the concentration of the solution.

L. M. J.

Spectroscopic Notes concerning the Gases of the Atmosphere. By LORD RAYLEIGH (*Phil. Mag.*, 1901, [vi], 1, 100—105).—According to Gautier, hydrogen is present in the atmosphere to the extent of about 2 parts in 10,000. The author, by examining the spectrum of the spark between platinum electrodes in a chamber through which dry air or other gas could be passed, finds that the C line is present when the chamber is filled with dry air, but experiments with other gases render doubtful the assumption that this line is actually due to atmospheric hydrogen.

A simple form of apparatus is described in which, operating with 5—10 c.c. of air and employing only three Grove cells, the spectrum of argon may be readily obtained.

By passing a current of carbon dioxide through a porous porcelain tube and absorbing the issuing carbon dioxide, a gaseous residue is obtained consisting chiefly of the lighter constituents of the atmosphere in which the D_3 helium line is observed. The success of the experiment depends greatly on the precautions observed to avoid the presence of other gases which had not diffused into the stream of carbon dioxide.

L. M. J.

Infra-red Spectra of the Alkalies. By HANS LEHMANN (*Chem. Centr.*, i, 1901, i, 81; from *Arch. wiss. Phot.*, 2, 216—222).—Photographs of the ultra-red spectra of potassium, rubidium, caesium, calcium, barium, magnesium, and iron have been obtained by means of extremely sensitive silver bromide gelatin plates suitably dyed. The lines observed ranged from 760—900 $\mu\mu$ wave-length, and agree well with those calculated from Kayser and Runge's law. The original paper contains reproductions of several spectra and also of the infra-red band spectrum of the carbon arc as far as wave-length 820 $\mu\mu$.

E. W. W.

Weston Cadmium Cell. By ERNST COHEN (*Proc. K. Akad. Wetensch. Amsterdam*, 1900, 380—382).—The author corrects the statement made in a previous paper (*Abstr.*, 1900, ii, 702), that the Weston cells used by Jaeger and Wachsmuth were metastable below 23°; it now appears that these cells are stable. This result, however, does not agree with certain dilatometer experiments, and the author reserves further criticism of the Weston cell until the behaviour of cadmium amalgams has been more thoroughly investigated.

J. C. P.

Electrode Potentials and Absolute Potentials. By N. T. M. WILSMORE and WILHELM OSTWALD (*Zeit. physikal. Chem.*, 1901, 36, 91—98. Compare this vol., ii, 2).—A discussion on the relative merits of the calomel and hydrogen electrodes as the starting point in the determination of potentials. Wilsmore holds (1), that the potential of the hydrogen electrode is more accurately defined than that of the calomel electrode; (2), that where acid or alkaline electrolytes are used, it is especially valuable. Ostwald points out that whilst in most cases knowledge of the relative potential is sufficient, there are cases where knowledge of the absolute potential is necessary (compare, for example, Ostwald, *Abstr.*, 1893, ii, 357); the potential of the calomel electrode is based on electrocapillary phenomena, and it is probable that the absolute value thus found is the correct one.

J. C. P.

Theory of the Decomposition Potentials of Fused Salts. By RICHARD LORENZ (*Zeit. anorg. Chem.*, 1900, 25, 436—458).—It is not safe to apply the methods used for the determination of the decomposition potentials of substances in aqueous solution to fused salts, because assumptions which are correct in the case of solutions are not necessarily so in the case of fused salts, which differ from solutions (1) in their physico-chemical nature, (2) in the fact that metals dissolve in them, (3) in the much greater rapidity of diffusion and mixing by eddy-currents, (4) in the greater rate of depolarisation of the electrodes.

The author supposes that when a gradually increasing E.M.F. is applied to a fused salt (for example, lead chloride) through indifferent electrodes, metal is liberated at the cathode which is at first almost completely dissolved by the electrolyte, the polarisation at the cathode remaining very small. As the E.M.F. increases and with it the quantity of metal liberated in unit time, the solution becomes more concentrated and the rate of solution of metal smaller until finally

the rate of deposition of metal exceeds the rate of solution and the maximum cathodic polarisation is attained. The same process occurs at the anode, the halogen rapidly diffusing into the whole of the anodic electrolyte until this is saturated. If the liquids surrounding the electrodes are not separated, the dissolved metal and halogen rapidly reunite, hindering or preventing the attainment of the maximum polarisation. According to the arrangement of the apparatus, the maximum polarisation may be reached first at one or other of the electrodes or simultaneously at both of them, and therefore the curves representing the connection between reverse E.M.F. and the applied E.M.F. may have a variety of forms. The author gives several of the characteristic shapes of curve which, according to his views, are to be expected, and states that they agreed with curves obtained experimentally. They exhibit changes of direction which correspond to the changes of direction in the current-E.M.F. curves obtained by Garrard (this vol., ii, 54), and which he takes to indicate decomposition potentials. When the anode and cathode liquids are separated from each other, the curve shows no *per saltum* change of direction, but the current increases in proportion to the applied E.M.F., so that it would appear as though fused salts may be decomposed by any E.M.F.

T. E.

Conductivities of some Double Salts as compared with the Conductivities of Mixtures of their Constituents. By CHARLES F. LINDSAY (*Amer. Chem. J.*, 1901, 25, 62—69. Compare Jones and Mackay, *Abstr.*, 1897, ii, 396; Jones and Ota, *Abstr.*, 1899, ii, 587; Jones and Knight, *Abstr.*, 1899, ii, 628).—The double salts studied were $\text{KCl}, \text{CdCl}_2$; $\text{K}_2\text{SO}_4, \text{NiSO}_4$; $(\text{NH}_4)_2\text{SO}_4, \text{MgSO}_4$. In each case, the conductivity of the double salt in concentrated solutions is slightly less than the conductivity of a mixture of the constituents having the same concentration as the double salt.

J. C. P.

Modification of the Common Method of Determining Transport Numbers and Investigation of the Influence of Concentration on these Numbers for some Ternary Salts. By ARTHUR A. NOYES (*Zeit. physikal. Chem.*, 1901, 36, 63—83).—If the dissociation of potassium sulphate and barium nitrate proceeds in stages, and if the proportion of the intermediate complex ion (KSO_4' or $\cdot\text{BaNO}_3$) diminishes with dilution, this change should betray itself in a marked alteration of the transport numbers with dilution. In the electrolysis of such salt solutions, the hydrogen and hydroxyl ions produced at the anode and cathode respectively travel so rapidly that they soon reach the middle portion of the solution; the electrolysis can thus last only a short time, the total quantity of salt transported is small, and the accuracy of the results is unsatisfactory. The author has got over this difficulty by adding to the anode and cathode solutions, as the electrolysis proceeds, enough alkali and acid to prevent the formation of hydrogen and hydroxyl ions. The apparatus employed consisted practically of two U-tubes, whose adjoining limbs are bent horizontally and may be connected by indiarubber tubing. The salts investigated were potassium sulphate, barium nitrate, and barium chloride, each at

two concentrations, (1) 0.1 gram-mol., (2) 0.02 gram-mol. per litre. The following table gives the transport numbers for the cation at 25° :

Concentration.	K ₂ SO ₄ .	Ba(NO ₃) ₂ .	BaCl ₂ .
0.1	0.493	0.455	0.415
0.02	0.496	0.456	0.442

The error in these numbers is certainly not more than a unit in the third place. The numbers for potassium sulphate agree with, those for barium nitrate and chloride are widely different from, the values obtained by Hittorf. The author's values for barium chloride lie between those of Hopfgartner (Abstr., 1898, ii, 151) and those of Bein (Abstr., 1898, ii, 553).

From the alteration of the above numbers with the dilution, the author concludes that the concentration of the KSO₄' ions in a 0.1 mol. solution of potassium sulphate does not exceed 1 or 2 per cent. of the total concentration. In the case of barium nitrate, it seems that no intermediate complex ions are formed. The alteration in the transport numbers for barium chloride is considerable, but the direction of the variation is opposite to what would be observed if the intermediate BaCl ions dissociated on dilution. The author considers the case analogous to that of the halogen compounds of cadmium, and supposes that in a 0.1 mol. solution of barium chloride complex ions exist (for example, BaCl₃' or BaCl₄''), formed by the addition of chloride molecules to Cl' ions, and that these ions are dissociated more and more with increasing dilution.

On the basis of the above numbers, and with the help of Kohlrausch's data (compare Abstr., 1899, ii, 201), the ionic conductivities of Ba⁺⁺ and SO₄'' may be calculated; the most probable values are found to be 54.4 for Ba⁺⁺, and 68.3 for SO₄''. J. C. P.

Calculation of Degree of Dissociation of strong Electrolytes. By SVANTE ARRHENIUS (*Zeit. physikal. Chem.*, 1901, 36, 28—40).—The author discusses Jahn's work (Abstr., 1900, ii, 522, 707), and defends the old method of calculating the degree of dissociation from the conductivity. For a concentration cell of the type AgAgCl | dilute solution of KCl | concentrated solution of KCl | AgClAg, the relation holds; $V = 1.98 \times 10^{-4} T [\Sigma m i \log.(c_1/c_0) + m(i_1 - i_0)/M]$ volt, where c_1 , c_0 are the concentrations, i_1 , i_0 van't Hoff's ionisation coefficients for the concentrated and dilute solutions respectively; m is the transport number of potassium and $M = \log_e 10$. When the values for the E.M.F. given by this equation are compared with Jahn's experimental results, the degree of dissociation being calculated from the conductivity, an excellent agreement is found. The method of calculating the degree of dissociation from the E.M.F. of concentration cells with the help of Nernst's formula is not trustworthy, since the unavoidable impurities are left out of account.

Exception is taken to Jahn's statement that van't Hoff's law is a direct consequence of Planck's equations; the author insists strongly on the prior importance of the formulæ and laws established by Raoult, van't Hoff, and others, and regards the formal thermodynamical treatment of the properties of solutions as purely secondary. J. C. P.

Electromotive Force and Osmotic Pressure. By FRIEDRICH KRÜGER (*Zeit. physikal. Chem.*, 1901, 36, 87—90).—It is pointed out that the expression deduced by Leffeldt (this vol., ii, 4) for the E.M.F. of a concentration cell is really the same as that deduced by Nernst in 1892. Leffeldt's contention (*loc. cit.*) that the E.M.F. depends on the total osmotic pressure of the salt, and not on that of the metallic ions alone, is regarded as entirely wrong.

The paper contains also a reply to Leffeldt's criticism (see this vol., ii, 5). J. C. P.

Relation between Expansion and Melting Points of Metals. By LÉMERAY (*Compt. rend.*, 1900, 131, 1291—1293).—If the rectangular co-ordinates of a number of points are taken to represent linear coefficient of expansion and absolute melting point of a number of metals, it is found that these points lie near the hyperbola $\lambda T' = \text{constant}$. As the cubical coefficient of expansion is approximately 3λ , it hence follows that the expansion between absolute zero and the melting point is equal for all these metals, or equal volumes of metals at absolute zero are also equal at the melting points. Lack of data prevents any rigorous test of the value of this generalisation. L. M. J.

Latent Heats of Vaporisation of some Carbon Compounds. By WLADIMIR F. LUGININ (*Compt. rend.*, 1901, 132, 88—89).—The following results were obtained :

	Latent heat of vaporisation.	Specific heat.
Aniline	104·17	0·5485 between 176·5° and 20°
Methylethylacetoxime ...	115·73	0·6503 „ 151·5 „ 21·9
Anisole	80·30	0·4806 „ 151·7 „ 20
Butyronitrile	115 25	0·5471 „ 113·3 „ 21

The values obtained by Trouton's formula indicate that in the cases of aniline, anisole, and butyronitrile there is no polymerisation, whilst with methylethylacetoxime the presence of the hydroxyl group causes polymerisation of the liquid molecules as in the alcohols and acids, although in the former case the hydroxyl group is directly united with nitrogen, whilst in the latter it is united with carbon. C. H. B.

Vapour Pressures of Binary Mixtures in the Light of van der Waals' Theory. By PH. KOHNSTAMM (*Zeit. physikal. Chem.*, 1901, 36, 41—62).—A theoretical paper largely unsuitable for abstraction. The author considers that too little attention has been paid by workers on this subject to van der Waals' theory (*Zeit. physikal. Chem.*, 1890, 5, 133—173), especially to his proposition that for liquids miscible in all proportions the vapour pressure curves (that is, the vapour pressure as a function of the composition (1) of the vapour, (2) of the liquid) have only one maximum or one minimum. The vapour pressure curve for mixtures of benzene and carbon tetrachloride is in accordance with this rule, in spite of Linebarger's results (*Abstr.*, 1896, ii, 408). The treatment of the whole subject in the works of Ostwald, Nernst, and Bancroft is adversely criticised, and it is pointed out that the

formulae of Duhem, Margules (compare Zawidzki, this vol., ii, 6), Leffeldt, and others are simply applications of van der Waals' theory.

J. C. P.

Vapour Tension of Ternary Mixtures. By FRANS A. H. SCHREINERMAKERS (*Arch. néerland. sci. exact. nat.*, 1900, [ii], 5, 214—226).—If the composition of a mixture is expressed in the usual equilateral triangle, and if, for any value of pressure and temperature, the potential is represented by the height above a base plane, then surfaces are obtained representing the liquid and vapour; of which, owing to its lower potential, the liquid surface will be the lower. In the simplest case, all mixtures are homogeneous, and the liquid and vapour surfaces may cut in one line $a_2 b_2$; if a tangent plane be rolled along to touch both surfaces, the points of contact lie on the lines $a b$, $a_1 b_1$. Mixtures represented by points within the figure $a b a_1 b_1$ separate into liquid and gaseous phases, outside this figure only one phase exists. The effects of variation of pressure, the addition of one of the constituents, &c., are considered. Where heterogeneous liquid mixtures can exist, the form of the surfaces are somewhat different, and the following equilibrium fields are obtained: liquid phase, two liquid phases, liquid and gaseous phases, gaseous and two liquid phases, gaseous phase. Effects of variation of conditions are considered, but the diagrams are necessary for their elucidation.

L. M. J.

Mixtures of Hydrogen Chloride and Methyl Ether. By J. P. KUENEN (*Arch. néerland. sci. exact. nat.*, 1900, [ii], 5, 306—311).—Methyl ether and hydrogen chloride yield a mixture boiling at 2° , and hence form an example of a mixture with a maximum boiling point and a minimum vapour pressure. The author attempted to trace this minimum up to the critical temperature, but it was found that before this was reached chemical action proceeds rapidly with the formation of methyl chloride and water. Complete investigation was hence impossible, but the results indicate that the minimum pressure exists up to the critical conditions, and that addition of hydrogen chloride raises the critical temperature of methyl ether. The curves actually obtained are given and prolonged to form the probable complete curve. Above the boiling point the mixture of the vapours is accompanied by considerable contraction, but the question of the molecular condition remains doubtful, as the contraction may be explained by association or by a high attraction constant.

L. M. J.

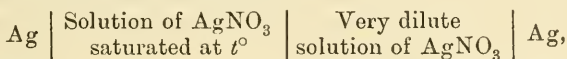
Heat of Formation of Mercaptans and Alkyl Sulphides. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1901, 132, 55—57).—The results obtained are summarised in the following table:

	Heat of combustion (const. vol.).	Molecular heat of combustion (const. press.).	Heat of formation from elements.
Ethyl hydrosulphide (mercaptan)	8313.6 cal.	+ 517.2 Cal.	+ 19.5 Cal.
Ethyl sulphide	9191.5 „	+ 829.6 „	+ 33.7 „
Amyl hydrosulphide	9513.0 „	+ 992.0 „	+ 34.65 „
Amyl sulphide	10165.0 „	+ 1775.7 „	+ 67.5 „
Allyl sulphide	9348.3 „	+ 1068.1 „	- 16.1 „

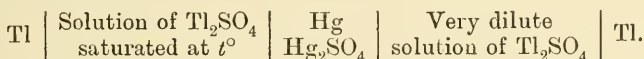
The thermal disturbance resulting from the substitution of oxygen for sulphur in the alkyl hydrosulphides and sulphides varies from +46.8 Cal. to +56.9 Cal. with a mean of +51.3 Cal., which approximates somewhat closely to the corresponding value in the case of water and hydrogen sulphide, carbon dioxide, and carbon disulphide, and metallic oxides and sulphides in solution. The differences between successive homologues is of the usual order of magnitude.

C. H. B.

Experimental Determination of the Limiting Heat of Solution. I. By ERNST COHEN (*Proc. K. Akad. Wetensch. Amsterdam*, 1900, 327—332).—Two methods are given for calculating L the fictitious quantity of heat evolved when a gram-molecule of a salt dissolves in its own concentrated solution. (1) If a galvanic cell be constructed according to the scheme



the application of the equation $E_e = E_c/n\epsilon_0 + T.dE./dT$, leads to the relation $L = W - \epsilon_0/n_1.(E_e - T.dE./dT)$, where W is the first heat of solution and n_1 is the migration constant of the NO_3 ions. (2) For a cell of the type



The following relation holds: $L = W - 2\epsilon_0(E_e - TdE/dT)$. The second method is preferable to the first, inasmuch as the values of migration constants in concentrated solutions are not known. The determinations of L made by the above methods will be published in a future paper.

J. C. P.

Heat of Solution of Resorcinol in Ethyl Alcohol. By CLARENCE L. SPEYERS and C. R. ROSELL (*Amer. J. Sci.*, 1900, [iv], 10, 449—450).—Resorcinol dissolves in large excess of ethyl alcohol with development of heat (see Speyers, *Abstr.*, 1896, ii, 410), and yet its solubility increases with rising temperature. This is shown to be consistent with the general law connecting the energy change of a reaction and the effect of rise of temperature; for heat is absorbed when resorcinol dissolves in a small quantity of alcohol, and dilution of a saturated solution is accompanied by rise of temperature. For a number of solutions of organic substances in water, ethyl alcohol, and other solvents, the authors have determined whether the final heat of solution is positive or negative; this was done by adding 5 to 10 per cent. of the pure solvent to the saturated solution.

J. C. P.

Liquefaction of Gaseous Mixtures. By F. CAUBET (*Compt. rend.*, 1900, 131, 1200—1202).—From the examination of the sets of complete isotherms for mixtures of carbon dioxide and sulphur dioxide (*Abstr.*, 1900, ii, 390), the following results are obtained. Every isotherm lower than the critical isotherm cuts the saturation curve in two points (1) a dew point, (2) a boiling point. The critical isotherm

cuts the saturation curve in a dew point and a critical point which may be regarded as either a dew point or a boiling point. Each isotherm of retrograde condensation cuts the saturation curve in two dew points, the first corresponding with the formation of liquid drops, the second with their disappearance. These results are in complete accord with the theoretical deductions of Duhem. L. M. J.

Liquefaction of Gaseous Mixtures. Variation of the Concentration of the two Co-existent Liquid and Gaseous Phases along the Isothermals. By F. CAUBET (*Compt. rend.*, 1901, 132, 128—131).—If a mixture of carbon dioxide and sulphur dioxide be subjected to isothermal compression, then between two values, P_1 , P_2 , a two phase mixture is formed; the composition of each phase is determined solely by the values of the pressure and temperature. From the isothermals previously obtained (*Abstr.*, 1900, ii, 390), these compositions can be deduced and curves are given showing the variation with pressure of the composition of both the liquid and gaseous phases, along isothermals from 59° to 89.6° . L. M. J.

Viscosities of Mixtures of Liquids and Solutions. By CHARLES H. LEES (*Phil. Mag.*, 1901, [vi], 1, 128—147).—Assuming the liquid to move along the y axis and that the velocity varies along the x axis but not along the z axis, then assuming the liquid to be made up of separate layers between longitudinal planes, (1) perpendicular to the x axis, (2) perpendicular to the z axis, (3) of both the preceding sets, the following three formulæ for the viscosity of the mixtures are obtained: (1) $1/\eta = v_1/\eta_1 + v_2/\eta_2$; (2) $\eta = v_1\eta_1 + v_2\eta_2$; (3) $\log. \eta = v_1 \log. \eta_1 + v_2 \log. \eta_2$, where v_1 , v_2 are the volumes of the two constituents in 1 c.c. of the mixture. These three formulæ are tested by comparison with observed values for various mixtures obtained by Thorpe and Rodger, by Linebarger and by Wijkander. None of the formulæ is entirely satisfactory, the first giving the best results. The author finds, however, that an empirical formulæ, $(1/\eta)^m = v_1(1/\eta_1)^m + v_2(1/\eta_2)^m$ where m varies with different liquids, gives values in good accord with the observations both for liquid mixtures and for solutions. If also rise of temperature is regarded as due to the mixture with a hotter liquid, then the mixture formula can also become a temperature formula and the empirical formula given is found to reduce to Slotte's temperature formula $\eta = \eta_0/(1 + at)^{1/m}$. L. M. J.

Osmosis of Liquids across Animal Membranes. By G. FLUSIN (*Compt. rend.*, 1900, 131, 1308—1309).—In the case of membranes of indiarubber, the velocity of osmosis of liquids has been shown to be dependent on the quantity of liquid absorbed in equal times (*Abstr.*, 1899, ii, 204). The experiments are now extended to animal membranes, a portion of pig's bladder, well washed with ether and alcohol, being used. Determinations were made of the osmotic velocity, and of the quantity of liquid absorbed by the membrane in five minutes in the case of water, methyl alcohol, amyl alcohol, amyl acetate, chloroform, benzene, ethyl ether, and ethyl alcohol. This list is in descending order of magnitude for both constants, so

that the deduction previously obtained for indiarubber membranes also holds good for animal membranes.

L. M. J.

Hydrolysis of Salts. By CARL KULLGREN (*Bihang K. Svenska Vetensk.-Akad. Handl.*, 1900, 25, ii, No. 2, pp. 1—34).—The author has studied the hydrolysis of sucrose at different temperatures by means of aqueous solutions of various strengths of the following salts: cadmium chloride, cadmium nitrate, magnesium chloride, magnesium nitrate, zinc nitrate, lead nitrate, aluminium chloride, and aluminium nitrate. His results show that the relative increase of the dissociation constants of salts is more rapid at low than at high temperatures, whilst in the case of aluminium chloride solution (3/160 equivs. per litre) such increase, which is considerable at lower temperatures, is no longer exhibited at 100°. This relative increase is also greater with weak solutions than with those more concentrated, a phenomenon which may be partly due to the greater inverting action of water on sucrose in the former case. The chlorides have in general about the same inverting power as the corresponding nitrates, although with cadmium chloride this power is about double that of the nitrate. The ratio between the inversion constants at 100° and at 85° has the value 3.78 for acids (acetic and succinic), but for salts it has higher values which in general vary but slightly with change of concentration; in most cases, this ratio has a high value when the inverting power is high. The amount of a salt hydrolysed increases with the dilution but follows no general rule; in the case of aluminium chloride solutions, the relation $x = k\sqrt{v}$ holds very approximately, x being the fraction of the total salt dissociated and v the dilution; for magnesium nitrate solutions, the amount of hydrolysis increases in arithmetical progression, whilst the dilution increases geometrically. The author's numbers are at variance with those of Long (*Abstr.*, 1896, ii, 414; 1897, ii, 547).

T. H. P.

Researches on Solutions. By GREGOIRE WYROUBOFF (*Bull. Soc. Chim.*, 1900, 25, 105—130).—The act of dissolution is defined as the disaggregation or setting at liberty the molecules of a solid. This must be accompanied by the absorption of heat, and those cases of dissolution in which the reverse occurs are accompanied by secondary phenomena, such as polymorphous changes, combination with solvent, &c. The chemical molecule is not, however, the physical unit of the solid, as is rendered evident by cases of allotropy and polymorphism. These physical units the author terms 'crystalline particles,' and he considers that many mistakes have occurred by the assumption that by the act of dissolution they are decomposed into the chemical molecules. The present paper chiefly consists of arguments to prove that this assumption is unjustifiable, and that different crystalline particles of the same compound may exist in solutions. Solutions of natural anhydrous sodium sulphate or thenardite, and of the fused salt yield different crystals when precipitated by alcohol if freshly prepared, but if allowed to remain some time before precipitation this is not the case. Supersaturation is regarded as due to the existence of different hydrates or forms in the solution, and as necessary conditions for the

formation of supersaturated solution the author postulates (1) existence of at least two forms or states of hydration, (2) at higher temperatures, greater stability of the more soluble form.

Monopotassium orthophosphate yields supersaturated solutions, and is usually considered as monomorphic, but the author states that microscopic examination reveals the existence of two forms. Certain peculiarities of solubility are discussed, which are not in accord with the views generally entertained regarding solution. Cerium sulphate exists in six different states of hydration, and solubility observations have led to varying results. A saturated solution of anhydrous salt at 24° was obtained and found to deposit crystals of $3\text{CeSO}_4 \cdot 8\text{H}_2\text{O}$, the solution then containing 10 per cent. CeSO_4 . At 24°, however, the solubility of this compound is only 8.16 per cent. and precipitation by alcohol yielded also some crystals of $3\text{CeSO}_4 \cdot 9\text{H}_2\text{O}$. It was found also that if to the saturated solution of the octahydrate crystals of the nonahydrate are added, the concentration is increased and does not again decrease by addition of the octahydrate. It is even possible to obtain 12.3 per cent. solutions in equilibrium with the octahydrate crystals (solubility 8.16). Somewhat similar results were obtained with thorium sulphate, solutions of various concentrations being obtained in contact with the same crystals. A saturated solution of the crystals of potassium cadmium sulphate with $1\frac{1}{2}\text{H}_2\text{O}$ contains 42.5 per cent. anhydrous salt, but if crystals of the dihydrate are added they dissolve, and the concentration increases to 49.5 per cent. The author contends that these results indicate the actual existence in the liquid of the various kinds of crystalline particles, and further communications are promised. L. M. J.

Solid Solutions in Mixtures of Three Substances. II. By GIUSEPPE BRUNI and F. GORNI (*Atti Real. Accad. Lincei*, 1900, [v], 9, ii, 326—332. Compare Abstr., 1900, ii, 197).—Freezing point determinations have been made of a large number of binary and ternary mixtures of the completely isomorphous compounds, *p*-dichloro-, *p*-chlorobromo-, and *p*-dibromo-benzene, and the curves for the ternary mixtures plotted on the ordinary triangular diagram. On the whole, the curves are regular, but near the angle representing the dichloro-compound they indicate a somewhat more complicated surface possessing points of minimum freezing point. T. H. P.

Reaction Velocity and Solubility. By WILDER D. BANCROFT (*Arch. néerland sci. exact. nat.*, 1900, [ii], 5, 46—48). The influence of solvents on reaction velocities is partly ascribable to viscosity. This is not the sole factor, however, and the author shows that solubility must also influence the velocity, and that decrease in the solubility of one of the reacting compounds tends to increase the rate at which the other is formed. Experimental evidence may, however, be difficult to obtain owing to the influence of other, as yet unknown, factors. L. M. J.

Inflammability of Thin Layers of Explosive Gases. III. By FRIEDRICH EMICH (*Monatsh.*, 1900, 21, 1061—1078. Compare Abstr., 1897, ii, 309, and 1899, ii, 12).—[With HEINRICH WALLAND.]—The temperatures of ignition of mixtures of electrolytic gas, with

varying proportions of nitrogen, hydrogen, or oxygen, have been determined by the Victor Meyer method. The addition of nitrogen scarcely alters the temperature at which electrolytic gas explodes; it is first slightly lowered and then slightly increased, the minimum being found with a mixture containing 30 per cent. of nitrogen. Somewhat similar results were obtained by the addition of hydrogen or oxygen.

[With V. VON CORDIER.]—Solutions of tricobalt tetroxide and of arsenic acid in concentrated hydrochloric acid have been shaken with hydrogen and air, but no differences were observed. The presence of ozone favours the ignition of electrolytic gas; for example, a mixture of 40 parts of hydrogen and 60 parts of 30 per cent. ozone is twice as inflammable as ordinary electrolytic gas.

The action of electric waves or Röntgen rays does not increase the inflammability of electrolytic gas. It is impossible to say whether the action of an excess of chlorine or oxygen in raising the inflammability of these gaseous mixtures is due to the small conductive coefficient of these gases or to the readiness with which the molecules of these gases are dissociated.

J. J. S.

Influence of Pressure in Phenomena of Chemical Equilibrium. By OCTAVE BOUDOUARD (*Compt. rend.*, 1900, 131, 1204—1206).—The author has previously shown that the reaction $\text{CO}_2 + \text{C} \rightleftharpoons 2\text{CO}$ proceeds as a reversible reaction in accordance with dynamical deductions (Abstr., 1900, ii, 199). The experiments were all conducted at atmospheric pressure, and are now supplemented by determinations at lower pressures which are completely in accord with the previous results, and again verify the formula then given.

L. M. J.

Equilibrium of Mixed Crystals with the Vapour Phase. By H. W. BAKHUIS ROOZEBOOM (*Arch. néerland sci. exact. nat.*, 1900, [ii], 5, 360—365).—In a plane diagram for pressure against percentage composition, the equilibrium of mixture and vapour may be represented at any definite temperature, so that by the addition of a temperature axis surfaces are obtained representing the equilibrium at all temperatures. With diagrams representing these surfaces, the author considers the cases where between certain temperatures mixed crystals may be formed.

L. M. J.

Theory of Chemical Catalysis. By CONSTANTIN ZENGELIS (*Ber.*, 1901, 34, 198. Compare Euler, this vol., ii, 57).—A claim for priority.

T. M. L.

Platinum Catalysis: Observations on Gas Cells. By RUDOLF HÖBER (*Pflüger's Archiv*, 1900, 82, 631—640. Compare Bredig and von Bernick, Abstr., 1900, ii, 213).—The author finds that the substances which influence the catalytic action of colloidal platinum reduce the electromotive force of an oxygen-hydrogen element with platinum electrodes. The action only occurs at the oxygen electrode, and is probably due to the formation of complex platinum salts.

Reference is also made to the bearing of these facts on the action of poisons on organic ferments.

J. J. S.

Molecular and Ionic Reactions. By PAUL ROHLAND (*Chem. Zeit.*, 1900, 24, 1014—1016).—The author emphasises and illustrates the difference between molecular and ionic reactions, especially as regards their velocity (compare Abstr., 1900, ii, 468). J. C. P.

A Small Laboratory Furnace. By ALBERT BRUNO (*Compt. rend.*, 1901, 132, 276—277).—The crucible is suspended in the middle of two truncated cones formed of iron wire gauze lined with asbestos cardboard several millimetres thick, and placed base to base. The lower cone is about twice as long as the upper one, and its truncated apex is a short distance above the orifice of the Bunsen burner.

C. H. B.

Apparatus for the Extraction of Solutions by means of Liquids of a Lower Specific Gravity. By C. A. NEUFELD (*Zeit. Nahr.-Genussm.*, 1901, 4, 15—16).—This is a modification of Bremer's apparatus. It essentially consists of an inner glass cylinder and an outer glass jacket. The first, which holds about 300 c.c., is intended for the solution to be extracted. After the solution has been put into the cylinder, a thistle funnel is introduced the stem of which ends in a ring with small openings. The solvent, which condenses in a Soxhlet condenser, drops into the funnel and there gradually displaces the solution to be extracted, until it finally passes in minute drops through the ring-holes, when it charges itself with the soluble matter. It then collects on the surface and runs through a tube into the distilling flask. An extraction is generally completed within 2 hours and a half.

L. DE K.

Inorganic Chemistry.

Action of Iodine and Bromine on Chlorine Heptoxide and Perchloric Acid. By ARTHUR MICHAEL and WALLACE T. CONN (*Amer. Chem. J.*, 1901, 25, 89—96. Compare Abstr., 1900, ii, 471).—It is stated that no reaction is known which offers the slightest evidence that bromine or iodine is capable of directly replacing chlorine in its oxy-acids (compare Potilizin, Abstr., 1888, 220).

In the preparation of chlorine heptoxide, it is advisable to cool the retort containing the phosphoric oxide to temperatures below -10° , and to keep it at that temperature for several hours; the mixture may be then very slowly warmed until about two-thirds of the heptoxide has passed over, the receiver is then changed, and the temperature gradually raised to 85° . By this process, the danger of an explosion is greatly reduced. The product of the action of iodine on chlorine heptoxide is a white solid, which, when heated under reduced pressure at 100° gives off an oily liquid and leaves a residue of iodine pentoxide. The oily liquid dissolves in water, giving perchloric acid. The reaction between iodine and chlorine heptoxide is apt to be violent, and explosions can easily result.

Iodine and perchloric acid do not react so vigorously, and the product is a yellow, crystalline substance, HI_7O_3 , which is very hygroscopic.

Kaemmerer's results (*Ann. Phys. Chem.*, 1869, 138, 406) cannot be confirmed; the only product obtained by the action of iodine on aqueous solution of perchloric acid is iodic acid. J. J. S.

Phosphorus Suboxide. By AUGUST MICHAELIS and K. VON AREND (*Annalen*, 1901, 314, 259—275. Compare Abstr., 1900, ii, 137).—It has been frequently observed that analyses of phosphorus suboxide give too high a percentage of phosphorus. During an investigation devoted to the elucidation of this point, the authors have again examined phosphorus suboxide derived from phosphorus and from hypophosphorus acid, because Chapman and Lidbury (*Trans.*, 1899, 75, 973) expressed the view that the substance precipitated by dilute acids from a solution of phosphorus in alcoholic potash was merely amorphous phosphorus, one reason for this conclusion being the fact that red phosphorus, when prepared by exposing white phosphorus to light, dissolves quite readily in alcoholic potash diluted with water.

The authors, however, have been unable to prepare by this method a specimen of red phosphorus giving nearly theoretical results on analysis. They find that a dry solution of white phosphorus in carbon disulphide yields a specimen containing sulphur and carbon, a trace of water giving rise to a product which contains oxygen; red phosphorus obtained from a solution in carbon tetrachloride contains carbon. When white phosphorus is placed under water and exposed to the action of light, almost pure phosphorus suboxide is produced.

The paper contains full details of the experimental methods employed in the investigation. M. O. F.

Combination of Boron Bromide with Phosphorus Chlorides. By TARIBLE (*Compt. rend.*, 1901, 132, 83—85).—Boron bromide combines with phosphorus trichloride at the ordinary temperature, yielding a colourless, crystallisable compound, $\text{PCl}_3 \cdot 2\text{BBr}_3$, which melts at about 58° , but sublimes at 40° , and decomposes before it boils.

In sealed tubes at about 150° , phosphorus pentachloride yields an analogous compound, $\text{PCl}_5 \cdot 2\text{BBr}_3$, which forms colourless crystals, sublimes at 100° , and melts and begins to decompose at about 151° .

Both compounds dissolve in boron bromide (from which they can be crystallised) and in carbon disulphide, but not in light petroleum or vaselin oil. They are readily decomposed by water, absorb ammonia with considerable development of heat, and are attacked by oxygen at a red heat.

No other compounds of the same proximate constituents are formed under similar conditions, and the compounds formed by the phosphorus chlorides are not analogous to those formed by the bromides.

C. H. B.

Action of Boron Bromide on the Phosphorus Iodides and the Haloids of Arsenic and Antimony. By TARIBLE (*Compt. rend.*, 1901, 132, 204—207).—The double bromoiodide, $\text{P}_2\text{I}_4 \cdot 2\text{BBr}_3$, is obtained in the form of golden-yellow crystals by adding boron

bromide to a carbon disulphide solution of the di- or tri-iodide of phosphorus; in the latter case, the reaction being attended by the liberation of iodine; the compound evolves iodine at 130° and melts at 145° ; it dissolves in boron bromide, carbon disulphide, and chloroform, but not in light or heavy petroleum. The substance, on heating, burns in oxygen, yielding bromine, iodine, and the anhydrides of phosphorus and boron; it is decomposed by chlorine or sulphur vapour, but may be distilled without alteration in a current of hydrogen. The bromiodide is decomposed by water with the production of phosphorous, boric, hydriodic, and hydrobromic acids; it absorbs ammonia gas, yielding a white, amorphous substance. When boron bromide is mixed with the trichloride of arsenic or antimony, a double decomposition takes place, resulting in the formation of boron chloride and the corresponding bromide of arsenic or antimony; antimony pentachloride under these conditions yields the tribromide and bromine. There is no interaction between boron bromide and the triiodides and tribromides of arsenic and antimony. G. T. M.

[Sulphides in] Bone Black. By F. STOLLE (*Zeit. Ver. deut. Zuckerind.*, 1901, 22—33).—Bone black does not, as is generally believed, contain calcium sulphide, and when heated, the calcium sulphate present is not reduced to sulphide, but gives up part of its sulphur, which forms ferrous sulphide with the iron reduced from the ferric oxide always present; if the amount of calcium sulphate present in bone black be increased, formation of calcium sulphide may occur. The diminution of the carbon content of bone black used in sugar refining is ascribed mainly to interchange taking place among the carbon-forming substances, and to a combustion of organic material.

T. H. P.

Action of Hypochlorous Acid on Metallic Chlorides. By W. VON TIESENHOLT (*J. pr. Chem.*, 1901, [ii], 63, 30—40; and *J. Russ. Phys. Chem. Soc.*, 1900, 32, 756—766).—When a solution of sodium chloride is treated with a small quantity of hypochlorous acid and evaporated to dryness, under certain conditions a residue is obtained which gives an alkaline reaction with phenolphthalein; the same result is observed with potassium chloride or barium chloride. If a stream of carbon dioxide is led into a strong boiling solution of barium chloride, and a solution of hypochlorous acid added drop by drop, barium carbonate separates after a certain time and at a definite concentration of the solution. If anhydrous calcium chloride is dissolved in the smallest possible quantity of hypochlorous acid solution, an energetic evolution of chlorine at once takes place; if carbon dioxide is now led into the boiling solution, a precipitate of calcium carbonate is immediately produced; when the solution is heated for a longer time without the introduction of carbon dioxide, calcium hydroxide separates, and the solution becomes strongly alkaline.

The conditions under which metallic hydroxides are produced from hypochlorous acid and chlorides are those which, according to Foerster and Jorre (*Abstr.*, 1899, ii, 278), favour most the formation of chlorates. The author considers that the production of chlorates under these conditions is preceded by the formation of alkali hydroxide, which is con-

verted by chlorine, first into hypochlorite and finally into the chlorate. The action of hypochlorous acid on metallic chlorides may be expressed by the equation, $\text{HClO} + \text{NaCl} = \text{NaOH} + \text{Cl}_2$, and the reaction between metallic hydroxides and chlorine may be regarded as reversible according to the equation, $2\text{NaOH} + \text{Cl}_2 \rightleftharpoons \text{NaOCl} + \text{NaCl} + \text{H}_2\text{O}$. The paper concludes with a discussion of the bearing of these facts on the formation and constitution of bleaching powder. E. G.

Preparation and Properties of Hydrates of Sodium Peroxide. By GEORGE F. JAUBERT (*Compt. rend.*, 1901, 132, 86—88).—When sodium peroxide is placed in a moist atmosphere free from carbon dioxide, it absorbs somewhat more than three times its weight of water without decomposing and without becoming pasty, and in this way the hydrates $\text{Na}_2\text{O}_2 \cdot 2\text{H}_2\text{O}$ and $\text{Na}_2\text{O}_2 \cdot 8\text{H}_2\text{O}$, as well as intermediate hydrates hitherto unknown, can readily be obtained. The hydrate, $\text{Na}_2\text{O}_2 \cdot 8\text{H}_2\text{O}$, was prepared in large quantity and forms a white, snow-like mass, readily soluble in water at the ordinary temperature, without any decomposition and with considerable reduction of temperature. It is less soluble in water at 0° , and this fact can be utilised to obtain it in a crystallised form. It dissolves in somewhat concentrated acids without notable elevation of temperature and yields solutions of hydrogen peroxide of remarkable stability. This hydrate is very stable at the ordinary temperature, but begins to decompose at $30\text{--}40^\circ$ and is completely decomposed at $80\text{--}100^\circ$ (compare this vol., ii, 96). C. H. B.

Sodium Peroxide. By ROBERT DE FORCRAND (*Compt. rend.*, 1901, 132, 131—133).—The results obtained by Jaubert (this vol., ii, 96) have been already published by the author (compare *Abstr.*, 1899, ii, 95). G. T. M.

Ammonium Amalgam. By ALFRED COEHN (*Zeit. anorg. Chem.*, 1900, 25, 430—435).—The fact that the gas evolved by ammonium amalgam consists of ammonia and hydrogen in the ratio $\text{NH}_3 : \text{H}$, points to the existence of ammonium in it. At the ordinary temperature, however, the amalgam does not precipitate metals such as copper and silver from solutions of their salts. When solutions containing salts of the alkali metals are electrolysed with an oxygen anode and a mercury cathode, a change of direction of the current—E.M.F. curve occurs at 1.52 volts, due to the discharge of hydrogen ions; a second change of direction is also found at a lower potential, which depends on the nature of the alkali metal. For ammonium this second point is found at 1.24 volts in complete analogy with the alkali metals.

Ammonium amalgam, prepared and preserved at 0° , does not swell up in the usual way; the evolution of gas only takes place when it is warmed. When such an amalgam is placed in a solution of copper sulphate at 0° in electrical connection with a plate of platinum, copper is deposited on the platinum and copper amalgam is formed. The objection that the reduction might be due to hydrogen is met by the fact that cadmium and zinc, metals which are not precipitated by hydrogen, may also be precipitated from their solutions by cold

ammonium amalgam. The metallic nature of ammonium is, therefore, beyond doubt. T. E.

Allotropic Modifications of Silver. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1901, 132, 234—241).—The author has measured the heat developed when different forms of silver are dissolved in a large excess of mercury, the results being calculated to 108 grams of silver :

Hammered silver in thin sheets.....	+ 2.03 Cal.
The preceding variety heated in oxygen at 550°	+ 0.47 „
Electrolytic silver in brilliant, acicular crystals	+ 0.10 „
Silver precipitated from the nitrate by copper and dried at the ordinary temperature over sulphuric acid in a vacuum	+ 1.19 „
Silver precipitated in the same way, but dried at 120°	+ 0.76 „
Silver precipitated in the same way, dried at 120°, and heated to dull redness.....	+ 0.08 „

It is evident that the various forms of the metal show considerable differences, which will give rise to different heats of formation of compounds prepared from them. For example, the maximum difference of 2 Cal. corresponds with a difference of 4 Cal. in the heat of formation of silver oxide, and 8 Cal. in the heat of formation of the sub-oxide, and in only one of the above cases would the heat of formation of the oxide be identical with the generally accepted value (7 Cal.). In the case of copper, as well as silver, and especially in the case of iron, the molecular condition of the metal is a factor of great importance in determining the thermal disturbance that will accompany a particular combination or interaction. C. H. B.

Compounds of Silver and Mercury. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1901, 132, 241—243).—Silver amalgams, prepared by direct combination of the metals, or by the action of mercury on solutions of silver nitrate, were dissolved in excess of mercury, and the thermal disturbance was measured. The results were: $\text{HgAg} + 0.33 \text{ Cal.}$, $\text{Hg}_2\text{Ag} - 0.50 \text{ Cal.}$, and $\text{Hg}_7\text{Ag}_6 - 0.58 \times 6 \text{ Cal.}$ In the first case, there is an initial absorption of heat which, however, is more than neutralised by the subsequent development of heat. The heats of formation of the amalgams calculated from these results are :

	Ordinary silver in thin sheets.	Crystallised silver.
$\text{Hg} + \text{Ag} = \text{HgAg}$	+ 2.36 Cal.	+ 0.23 Cal.
$\text{Hg}_2 + \text{Ag} = \text{Hg}_2\text{Ag}$	+ 1.53 „	- 0.40 „
$\text{Hg}_7 + \text{Ag}_6 = \text{Hg}_7\text{Ag}_6$	+ 2.17 $\times 6$ „	+ 0.24 $\times 6$ „

If the mercury is taken as being solid, these values must be reduced by 0.55 Cal. for each atom of mercury. C. H. B.

Action of Silver Salts on Ammonium Persulphate Solution. By HUGH MARSHALL (*Proc. Roy. Soc. Edinburgh*, 1900, 23, 163—168).—Solutions of potassium persulphate and silver nitrate yield a black precipitate of silver peroxide, Ag_2O_2 , this result being, in all probability,

due to the hydrolysis of the silver persulphate formed. When ammonium persulphate is employed instead of the potassium salt, less peroxide is precipitated, but there is, nevertheless, considerable decomposition of the persulphate, as indicated by the formation of sulphate and free sulphuric acid. When ammonia is added to the solution containing ammonium persulphate and the silver salt, there is no deposition of peroxide, but a rapid evolution of the nitrogen produced by the oxidation of ammonia by silver peroxide; in concentrated solutions, the action is very violent and may become uncontrollable. The silver salt acts catalytically, a small amount being sufficient to determine the decomposition of large quantities of persulphate and ammonia in accordance with the following equation: $3(\text{NH}_4)_2\text{S}_2\text{O}_8 + 8\text{NH}_3 = 6(\text{NH}_4)_2\text{SO}_4 + \text{N}_2$.

Ammonium persulphate is slowly decomposed in aqueous solutions containing silver salts without evolving any gas, the change taking place in the following manner: $8(\text{NH}_4)_2\text{S}_2\text{O}_8 + 6\text{H}_2\text{O} = 7(\text{NH}_4)_2\text{SO}_4 + 9\text{H}_2\text{SO}_4 + 2\text{HNO}_3$. A quantitative study of the change shows that for moderate concentrations the rate of decomposition is proportional to the strength of solution.

Considerable quantities of nitric acid are produced on heating concentrated solutions of the persulphate and silver salt, and at the boiling point ozonised oxygen is evolved. The catalytical action of the silver salts on ammonium persulphate gives rise to many interesting cases of oxidation, of which the following may be noted: the bleaching of indigo and methyl-orange, and the oxidation of a chromic salt to chromic acid in an acid solution.

The action of silver compounds has, in addition, an important bearing on the use of ammonium persulphate as a "reducer" in photography. G. T. M.

Electrolysis of Salts in Organic Solvents. By A. W. SPERANSKY and E. G. GOLDBERG (*J. Russ. Phys. Chem. Soc.*, 1900, 32, 797—804).—A number of experiments have been made to find out whether the electrolysis of salts in organic solvents yields the metals in a hard, compact form. Acetone and methyl alcohol solutions of cupric and cobalt chlorides, as well as pyridine solutions of lithium chloride, mercuric iodide, and lead nitrate, did not give good results, as the solutions are either non-conducting or give non-metallic deposits. With a pyridine solution of silver nitrate, aqueous solutions of which yield on hydrolysis dendritic masses of silver, better results are obtained, the silver being deposited in a compact mass firmly attached to the platinum cathode. On passing the same current through aqueous and pyridine solutions of silver nitrate, the latter yields slightly more silver than the former, the mean difference for three experiments being 0.25 per cent; this is probably due to a reducing action exerted by the pyridine on the silver salt. When an anode consisting of equal quantities of silver and copper is employed, the electrolyte being silver nitrate, the silver deposited on the cathode does not contain a trace of copper. In the same way, pure silver is obtained from a pyridine solution of a mixture of silver and lead nitrates, the anode being of lead. Means of separation of silver from copper and from lead are

thus presented. In pyridine solutions of silver nitrate with concentrations of from 3.13 to 13.66 per cent., the salt has a mean molecular weight of 208.8 instead of the theoretical value, 169.55; the molecules are hence, not only non-dissociated, but exist as polymerides, the statement of Werner (*Abstr.*, 1898, ii, 214) that silver nitrate has the normal molecular weight in pyridine being inaccurate. T. H. P.

Borates of Magnesium and the Alkali-earth Metals. By LÉON OUVARD (*Compt. rend.*, 1901, 132, 257—259).—When magnesium oxide in slight excess is heated to redness with a mixture of boric anhydride and potassium hydrogen fluoride in molecular proportion, the borate $3\text{MgO} \cdot \text{B}_2\text{O}_3$, is obtained in transparent, acicular prisms which show longitudinal extinction; they are not affected by boiling water or acetic acid, but dissolve in inorganic acids. Calcium, barium, and strontium oxides, under the same conditions, yield analogous compounds, which are not affected by cold water, but are decomposed by boiling water and are soluble in acetic acid unless it is very dilute. C. H. B.

Electrolytic Deposition of Lead from Solutions. By L. GLASER (*Zeit. Elektrochem.*, 1900, 7, 365—369 and 381—386).—Homogeneous metallic lead is deposited from slightly acid concentrated solutions of lead nitrate or acetate, containing, preferably, considerable quantities of the corresponding alkali salts, by a current of about 0.004 ampere per sq. cm. at the cathode. When an anode of lead is used, the E.M.F. is about 0.1 volt. When the conditions are such that lead hydroxide can be formed at the cathode, spongy lead is deposited. Concentrated solutions of lead or alkali salts dissolve considerable quantities of lead hydroxide; when such a solution is electrolysed, the removal of lead from the layer of solution in contact with the cathode dilutes it. This more dilute solution deposits the lead hydroxide or basic lead salt which it contains on the cathode, and so prevents the regular deposition of the metal giving rise to the spongy deposit.

Lead chloride and sulphate give unsatisfactory results owing largely to the formation of insoluble lead chloride or peroxide at the lead anode. By using very small current densities and E.M.F.'s, it is, however, possible to obtain coherent deposits.

The deposition of lead may be utilised for plating objects with lead or for separating lead and silver, the alloy being used as anode in a solution of nitrate saturated with chloride; the silver remains behind undissolved.

Coherent deposits of lead are also obtained, although with more difficulty, from alkaline solutions. The concentration of the lead ions is so small in these solutions that the liquid surrounding the cathode soon becomes so impoverished that the E.M.F. rises, and the next available cathion (an alkali metal) is discharged. This results in the secondary reduction of lead sponge. By keeping the E.M.F. low and replacing the liquid in contact with the cathode by vigorous stirring, however, good deposits may be obtained.

The analogy between the deposition of lead and of zinc is pointed out. T. E.

Radio-active Lead. By KARL A. HOFMANN and EDUARD STRAUSS (*Ber.*, 1901, 34, 8—11).—The radio-activity of the "pure lead sulphate," isolated from bröggerite and other minerals (this vol., ii, 19), is enhanced by boiling it with sodium carbonate solution, converting the carbonate so obtained into chloride, and crystallising this from water; the sulphate prepared from the less soluble fractions of the chloride is only feebly radio-active, but that obtained from the more soluble fractions is intensely active. The active sulphate shows a blue fluorescence when exposed to the cathode rays, the radio-activity being thereby increased; its spark spectrum is characterised by a line in the violet. It contains 41·35—42·00 per cent. SO_4 , although lead sulphate should contain only 31·71 per cent.; bismuth sulphate contains 40·86 per cent. SO_4 , but the possibility of bismuth being present is excluded by the method used for purifying the substance. A solution of potassium iodide converts the sulphate into a mass of yellow crystals, which dissolve in warm dilute hydrochloric acid but separate again on heating. On shaking with an excess of potassium iodide containing hydrochloric acid, iodine is liberated. The sulphide and hydroxide prepared from the active sulphate are similar in all respects to the true lead salts; a second sulphate, however, is derivable which contains 22·34 per cent. SO_4 , showing that the metal present is both bivalent and quadrivalent, and probably has an atomic weight of about 260.

On keeping for several months, the radio-activity of the "lead" sulphate diminishes, but can be entirely restored by exposing it to the cathode rays.
W. A. D.

Thallium Chlorobromides of the Type $\text{TlX}_3\cdot 3\text{TlX}$. By VICTOR THOMAS (*Compt. rend.*, 1901, 132, 80—83).—The yellow product obtained by the action of bromine on thallous chloride in presence of water varies in composition, but when dissolved in water and recrystallised, the first product obtained is always the chlorobromide, $\text{Tl}_4\text{Cl}_3\text{Br}_3$, and this compound is likewise obtained when bromine is added to a warm concentrated solution of thallous chloride.

When the compound $\text{Tl}_3\text{Cl}_2\text{Br}_4$ (this vol., ii, 60) is treated with a large quantity of water, it yields a yellow substance which is similar in appearance to the product of the action of bromine on thallous chloride, and likewise yields the compound $\text{Tl}_4\text{Cl}_3\text{Br}_3$ when recrystallised.

If the chlorobromides $\text{Tl}_4\text{Cl}_4\text{Br}_2$ and $\text{Tl}_4\text{Cl}_2\text{Br}_4$ exist, which is doubtful, they are unstable and decompose when recrystallised, yielding the compound $\text{Tl}_4\text{Cl}_3\text{Br}_3$, which is always formed when thallium, chlorine, and bromine in the form of haloid salts are present together with a sufficient quantity of water. If, however, the solution is concentrated and contains a high proportion of thallic salts, the products seem to belong to the type $\text{TlX}_3\cdot \text{TlX}$.
C. H. B.

Electrical Deposition of Copper. By J. CAMPBELL DICKSON (*Proc. Phil. Soc. Glasgow*, 1900, 31, 52—65).—The author has studied the way in which the character and amount of the copper deposit from solutions of copper sulphate are affected by alterations in the density of the solutions, and by the presence of acid. Solutions of high

specific gravity give more consistent and trustworthy deposits than solutions of low specific gravity, and the best results are obtained when acid is present. The corrosion of copper plates in copper sulphate has been studied, and the results obtained help to explain the relative behaviour of the solutions just referred to. The author recommends that in the electrolytic deposition of copper from copper sulphate, the solution should have a density of about 1.185, 0.5 per cent. by volume of sulphuric acid should be added, and the current density should be about 60 sq. cm. per ampere.

J. C. P.

Reduction of Mercuric Salts by Hydrogen Peroxide. By A. KOLB (*Chem. Zeit.*, 1901, 25, 21).—In the presence of excess of potassium hydroxide or ammonia, mercuric salts are reduced to metal by adding a 3 per cent. solution of hydrogen peroxide and applying heat. In the case of an ammoniacal solution, the reduction is, however, not complete unless a tartrate is present. Even mercuric cyanide may be completely reduced by heating with potassium hydroxide and hydrogen peroxide. Neutral or acid solutions of mercuric salts are not reduced by hydrogen peroxide, but in the presence of sodium potassium tartrate, mercuric chloride is completely reduced to the mercurous state.

L. DE K.

Rarefied Gases. By ALBERT COLSON (*Compt. rend.*, 1900, 131, 1202—1204).—Glass tubes of about 50 c.c. capacity containing about 5 grams of red or yellow mercuric oxide were exhausted to a pressure of about $1/200000$ atmosphere and exposed to daylight for a few months. It was then found that a quantity of mercurous oxide and a mirror of mercury had been formed. Examination of the contents showed that 0.6 c.c. of a gas containing 0.2 c.c. of oxygen was present, but analysis proved the loss of oxygen of the mercuric oxide to correspond with over 1.0 c.c. of oxygen, the greater part of which must hence have been removed by some reducing agent emitted from the glass. Other series of experiments were made under different conditions in vacuum tubes and in tubes containing hydrogen; the results are more marked for red than for yellow mercuric oxide, but all confirm the previous result that the glass gives off some reducing agent (compare Trowbridge, *Abstr.*, 1900, ii, 701).

L. M. J.

Nona-hydrated Double Iodide of Mercury and Lithium. By D. DOBROSERDOFF (*J. Russ. Phys. Chem. Soc.*, 1900, 32, 774—779).—From a solution of precipitated mercuric iodide in saturated lithium iodide solution, the double compound of the composition $2\text{LiI} \cdot \text{HgI}_2 \cdot 9\text{H}_2\text{O}$, is deposited in the form of soft, waxy, honey-yellow, hygroscopic plates, which float on the mother liquor.

T. H. P.

Isolation of Yttria, Ytterbia, and Neo-erbia. By G. and E. URBAIN (*Compt. rend.*, 1901, 132, 136—138. Compare *Abstr.*, 1898, ii, 518; 1900, ii, 346).—The crude rare oxides from gadolinite, converted into ethyl sulphates, yielded after ten crystallisations a mother liquor containing only yttrium, erbium, and ytterbium with a trace of thorium. The soluble ethyl sulphates were converted into nitrates and further fractionation was effected by means of the fusion method; the least basic oxides finally obtained consisted of ytterbia and thoria and these

substances were separated by Wyrouboff and Verneuil's process. Gadolinite contains very little thorium, 1 gram being isolated from 25 kilos. of the mineral; the radio-activity of the specimen is identical with that of the element derived from thorite.

The atomic weight of ytterbium is 172.6, that of yttrium is 88.6; their solutions are quite free from absorption bands, and the yttria prepared by the authors does not exhibit the phosphorescent spectrum shown by other specimens; this is probably due to its freedom from gadolinium metals, these elements being readily removed by the ethyl sulphate separation which greatly diminishes the proportion of the intermediate fractions. G. T. M.

Combination of Aluminium Chloride with Ammonia. By E. BAUD (*Compt. rend.*, 1901, 132, 134—136).—The results of Persoz's investigation (*Ann. Chim. Phys.*, 1830, [ii], 44, 319) on the combination of ammonia and aluminium chloride are not substantiated by the author.

The *ammonio-salt* $\text{Al}_2\text{Cl}_6 \cdot 12\text{NH}_3$, produced on treating anhydrous aluminium chloride with excess of dry ammonia at the ordinary temperature, is a very stable substance, and far less hygroscopic than the original chloride; when heated at 180° , it loses only 2 mols. of ammonia, forming the *compound*, $\text{Al}_2\text{Cl}_6 \cdot 10\text{NH}_3$. The latter substance, when heated in a stream of hydrogen, melts at 380° and boils at 450° , the white, pulverulent *salt*, $\text{Al}_2\text{Cl}_6 \cdot 2\text{NH}_3$, condensing in the receiver; when the distillation is performed without employing hydrogen, the product has the composition $\text{Al}_2\text{Cl}_6 \cdot 4.61\text{NH}_3$, and consists of a mixture of the di- and deca-ammonio-salts.

At temperatures near the boiling point of ammonia, the deca-ammonio-salt absorbs more of the gas, forming an unstable compound containing 17 or 18 mols. of ammonia. G. T. M.

Iron and Steel from the Standpoint of the Phase Rule. By HANNS VON JÜPTNER (*Chem. Centr.*, 1901, i, 83, 162; from *Stahl. u. Eisen*, 1900, 20, 1205—1212, 1269—1273).—The paper describes the phenomena accompanying the solidification of iron containing carbon, and in so far is on the same lines as Roozeboom's (*Abstr.*, 1900, ii, 728). The author, however, considers the phenomena under the conditions of rapid cooling, in which case the crystals are in equilibrium only with the neighbouring part of the fused mass. For 0.5—2.0 per cent. of carbon, and the temperature interval 1535—1130, $^\circ$ the author calculates the part of the fused mass which remains liquid when an exchange of carbon between the crystals and the fused mass (1) takes place, (2) does not take place. When all exchange is prevented, a certain portion becomes solid only at the eutectic point. The influence of supercooling is taken into account also.

Roozeboom supposes that at 1000° a saturated solution of carbon in iron contains 1.8 per cent. of carbon; several observations, however, point to the solubility being lower, about 1.5 per cent. It is possible that martensite changes at 690° into ferrite and graphite. Sorbite and troostite are probably transition stages between other forms, and their existence is accordingly due to retardation phenomena, J. C. P.

Cobalt Peroxide. By THOMAS BAYLEY (*Chem. News*, 1900, 82, 179—180).—Determinations of the composition of cobalt peroxide by dissolving the washed precipitate in dilute sulphuric acid in the presence of a known excess of ferrous sulphate and subsequent titration with dichromate, indicate that chlorine and bromine in the presence of sodium hydroxide precipitate an oxide of the formula Co_3O_5 at the ordinary temperature, and a lower form at 100° ; the action of hydrogen peroxide is less definite even at the ordinary temperature.
D. A. L.

A New Oxide of Molybdenum: Molybdenum Semipentoxide. By PETER KLASON (*Ber.*, 1901, 34, 148—153).—When ammonium molybdate is heated with hydrochloric acid containing ammonium iodide (1 mol.) and a small quantity of ammonium chloride until no more iodine is set free, and the residue is then saturated with gaseous hydrogen chloride, *ammonium molybdenyl chloride*, $\text{MoOCl}_3 \cdot 2\text{NH}_4\text{Cl}$, separates in beautiful, green octahedra. It is stable in the air, is not deliquescent, and crystallises from water on saturating with hydrogen chloride; the substance, $3\text{MoCl}_4 \cdot 2\text{NH}_4\text{Cl} \cdot 6\text{H}_2\text{O}$, described by Blomstrand, was probably impure ammonium molybdenyl chloride. On dissolving in water alone it is completely hydrolysed, and, in this state, spontaneously oxidises to molybdenum blue; by alcohol also, it is decomposed, the ammonium chloride being mostly removed. *Molybdenyl hydroxide*, $\text{MoO}(\text{OH})_3$, is precipitated on adding exactly 3 mols. of ammonia to an aqueous solution of the chloride, in a form closely resembling freshly precipitated ferric hydroxide, only brighter in colour; sodium acetate can also be used as a precipitant. It is soluble in water to the extent of 2 parts in 1000, but insoluble in presence of ammonium chloride; it has no acid properties, since it does not dissolve in aqueous alkali hydroxides, and is only slightly soluble in ammonia and alkali carbonates. If in its preparation an excess of ammonia be used, the hydroxide is partially decomposed, and the filtered solution contains much molybdic acid, as stated by Debray; the nature of the precipitate here obtained is being investigated. *Molybdenum semipentoxide*, Mo_2O_5 , obtained by heating the hydroxide in a current of carbon dioxide, is a violet-black powder, soluble in sulphuric and hydrochloric acids to an extent diminishing with the temperature of its formation; it contains traces of molybdic acid which can be removed by alkalis, and also of molybdenum dioxide.

Blomstrand's oxychloride, $2\text{Mo}_3\text{Cl}_{16} \cdot \text{Mo}_3\text{O}_8$, which Püttbach (*Annalen*, 1880, 201, 123) has considered to be MoOCl_4 , is apparently molybdenyl chloride, since, when dissolved in concentrated hydrochloric acid containing ammonium chloride, it yields the salt, $\text{MoOCl}_3 \cdot 2\text{NH}_4\text{Cl}$.
W. A. D.

The Molybdic Acids. By PETER KLASON (*Ber.*, 1900, 34, 153—158).—Analyses of ordinary ammonium molybdate agree as well with the formula $5\text{NH}_3 \cdot 6\text{MoO}_3 \cdot 6\text{H}_2\text{O}$ as with Delafontaine's formula, $6\text{NH}_3 \cdot 7\text{MoO}_3 \cdot 7\text{H}_2\text{O}$; determinations of the molecular weight in aqueous solution, taking into account the degree of dissociation indicated by the electrical conductivity, show that it is probably a double salt, $(\text{NH}_4)_3\text{H}_3\text{Mo}_3\text{O}_{12} \cdot (\text{NH}_4)_2\text{H}_4\text{Mo}_3\text{O}_{12}$, which is resolved into its con-

stituents, triammonium and diammonium trimolybdates, when dissolved in water. This view is confirmed by the fact that on adding the calculated quantity of ammonia to the solution, the salt, $(\text{NH}_4)_3\text{H}_3\text{Mo}_3\text{O}_{12}\cdot 4\text{H}_2\text{O}$, separates; this substance was erroneously described by Rammelsberg (*Ann. Phys. Chem.*, 1866, [ii], 127, 298) as $3(\text{NH}_4)_2\text{O}\cdot 7\text{MoO}_3\cdot 12\text{H}_2\text{O}$. Moreover, by adding the calculated quantities of hydrochloric acid, *diammonium trimolybdate*, $(\text{NH}_4)_2\text{H}_4\text{Mo}_3\text{O}_{12}\cdot \text{H}_2\text{O}$, and *ammonium trimolybdate*, $(\text{NH}_4)\text{H}_5\text{Mo}_3\text{O}_{12}$, can be obtained, the former as a granular crust, the latter in slender needles; both salts are decomposed by water, and when dried over phosphoric oxide at the ordinary temperature lose respectively $1\frac{1}{2}$ and $2\text{H}_2\text{O}$; Berlin (*J. pr. Chem.*, 1850, 49, 445) has described the latter salt as $2\text{NH}_3\cdot 4\text{MoO}_3\cdot 3\text{H}_2\text{O}$.

Commercial molybdic acid is really *ammonium anhydrotrimolybdate*, $\text{NH}_3\cdot 3\text{MoO}_3\cdot \frac{1}{2}\text{H}_2\text{O}$. A double salt, $3\text{NH}_3\cdot 6\text{MoO}_3\cdot 5\text{H}_2\text{O}$, intermediate between diammonium and ammonium trimolybdates, was prepared by mixing solutions of these salts and also from ordinary ammonium molybdate by adding the calculated quantity of hydrochloric acid; it forms well-defined, transparent crystals. Svanberg and Struve's salt, $2\text{NH}_3\cdot 2\text{MoO}_3\cdot \text{H}_2\text{O}$, could not be obtained.

Triammonium pentadecamolybdate, $3\text{NH}_3\cdot 15\text{MoO}_3\cdot 20\text{H}_2\text{O}$, prepared by adding either the theoretical or twice the theoretical quantity of hydrochloric acid to a solution of ordinary ammonium molybdate, forms microscopic, six-sided prisms, and can be crystallised by adding it to boiling water and evaporating at the ordinary temperature; if, however, the salt be added to cold water and then warmed, it yields the insoluble *anhydride*, $3\text{NH}_3\cdot 15\text{MoO}_3\cdot 6\text{H}_2\text{O}$. *Triammonium dodecamolybdate*, $3\text{NH}_3\cdot 12\text{MoO}_3\cdot 12\text{H}_2\text{O}$, obtained by adding ammonium chloride to a hot solution of the pentadecamolybdate, crystallises in lustrous aggregates of needles, and is the parent substance of ammonium phosphomolybdate.

W. A. D.

Molybdenum Blue. By PETER KLASON (*Ber.*, 1901, 34, 158—160).—Molybdenum blue does not appear to contain the dioxide, MoO_2 , as hitherto assumed (compare Guichard, *Abstr.*, 1900, ii, 658), but the semipentoxide, Mo_2O_5 , (preceding abstracts). An *insoluble molybdenum blue*, $\text{Mo}_2\text{O}_5\cdot 24\text{MoO}_3\cdot 24\text{H}_2\text{O}$, is formed on exposing an aqueous solution of ammonium molybdenyl chloride to oxidation by air for several months; if the exposure be shorter, a *soluble form*, $\text{Mo}_2\text{O}_5\cdot 18\text{MoO}_3\cdot 21\text{H}_2\text{O}$, is obtained which can be precipitated by adding ammonium chloride. The insoluble substance is, apparently, an analogue of phosphomolybdic acid in which $\text{P}_2\text{O}_5 : \text{MoO}_3 = 1 : 24$.

W. A. D.

Tungsten Arsenide and Chloroarsenide. By EDOUARD DEFACQZ (*Compt. rend.*, 1901, 132, 138—140. Compare *Abstr.*, 1900, ii, 350).—*Tungsten arsenide*, WAs_2 , prepared by heating tungsten hexachloride in a current of hydrogen arsenide from 150° to 350° , is a black, crystalline substance insoluble in water and other solvents, and having a sp. gr. 6.9 at 18° . The compound is stable in air at the ordinary temperature, but is readily oxidised at a dull red heat to arsenious and tungstic oxides; hydrogen reduces it completely at 400 — 550° , chlorine under

these conditions yields arsenious chloride and tungsten hexachloride, whilst tungsten disulphide and phosphide are produced by the action of heated sulphur and phosphorus respectively. Hot sulphuric acid attacks the arsenide, evolving sulphur dioxide; hot nitric acid oxidises the substance to tungstic acid. Hydrofluoric and hydrochloric acids have no action on the arsenide, but a mixture of either of these with nitric acid readily dissolves the substance.

Tungsten arsenide is insoluble in aqueous solutions of the alkaline hydroxides, but is readily decomposed by the fused reagents and also by potassium nitrate and carbonate, the final products being alkali arsenates and tungstates. Fused copper reduces the arsenides, yielding metallic tungsten; it was not found possible to produce a subarsenide corresponding with the lower phosphide.

Tungsten chloroarsenide, W_3AsCl_9 , produced by heating a mixture of tungsten hexachloride and liquid hydrogen arsenide in a sealed tube at $60-75^\circ$, is obtained in the form of bluish-black crystals resembling the hexachloride; the substance is hygroscopic and decomposed by water and acids; it is insoluble in the common anhydrous organic solvents, but readily dissolves in aqueous solutions of the alkali hydroxides; dilute nitric acid readily oxidises the substance, yielding a colourless solution and a yellow precipitate of tungstic acid.

G. T. M.

Double Chlorides of Uranyl and the Alkali Metals. **Hydrochloride of Uranyl Chloride.** By JULES ALOY (*Bull. Soc. Chim.*, 1901, [iii], 25, 153—155).—The double chlorides of uranyl and sodium or potassium are obtained in the anhydrous state, with the composition $UO_2Cl_2 \cdot 2KCl$ and $UO_2Cl_2 \cdot 2NaCl$, by passing dry chlorine successively over heated uranium oxide and the heated alkali chloride. They are golden-yellow compounds which melt at a red heat without decomposition, and are very soluble in water. The chlorides of the alkaline earth metals do not yield analogous compounds under the conditions described.

When a saturated hydrochloric acid solution of uranyl chloride is cooled to -10° , crystals of a very unstable *hydrochloride*,



are obtained.

N. L.

Uranium Nitrate. By WILLIAM OECHSNER DE CONINCK (*Compt. rend.*, 1901, 132, 90—91. Compare this vol., ii, 104, 105).—Solutions of uranium nitrate in (I) dilute nitric acid of sp. gr. 1.153, and (II) dilute sulphuric acid of sp. gr. 1.138 have the following sp. gr.:

Quantity of salt in } 100 parts of acid. }		1.	2.	3.	4.	5.
I {	t°	11°	11.8°	11.3°	12.0°	11.6°
	Sp. gr.	1.1585	1.1614	1.1663	1.1698	1.1751
II {	t°	11.2°	11.8°	10.7	12.0°	11.4°
	Sp. gr.	1.1427	1.1450	1.1511	1.1540	1.1576

One part of uranium nitrate dissolves in 23.5 parts of methyl alcohol at $11.2-11.6^\circ$, in 16 parts of ether at $11.9-12.7^\circ$, in 18.4 parts of ethyl acetate at $10.3-10.7^\circ$, and in 5.3 parts of concentrated formic acid at $15.1-15.6^\circ$.

C. H. B.

Uranium Nitrate. By WILLIAM OECHSNER DE CONINCK (*Compt. rend.*, 1901, 132, 204. Compare preceding abstract).—Crystallised uranium nitrate, when rapidly calcined, yields a red modification of uranium sesquioxide which seems to be a polymeride of the orange variety; the latter, which is formed by gradually decomposing the nitrate, is partially transformed into the new modification on prolonged heating at a dull red heat. The red polymeride, when heated for 40 hours at a dull red heat or at higher temperatures, is partially converted into a brown oxide; it does not, however, yield the green oxide on heating to redness in a closed platinum crucible.

G. T. M.

Uranium Red. By VOLKMAR KOHLSCHÜTTER (*Annalen*, 1901, 314, 311—338).—Uranium red is the name by which Remelé (*Ann. Phys. Chem.*, 1864, [ii], 124, 114; 1865, 125, 209) distinguished the substance obtained by Patera (*J. pr. Chem.*, 1850, 51, 122) on precipitating uranium nitrate or chloride with ammoniacal hydrogen sulphide, and allowing the product to change spontaneously. The author has subjected this compound to a close investigation, the results of which may be summarised as follows. (1) Alkaline, neutral, and even slightly acid solutions of uranic acid are reduced by hydrogen sulphide. (2) In presence of alkali, the reduction may be retarded if the action of hydrogen sulphide on the alkali uranate takes place in a solution containing excess of uranyl sulphate or nitrate. (3) Under these conditions, an orange-yellow compound is produced, yielding the blood-red substance, "uranium red," when treated with alkali. (4) Uranium red contains uranium, sulphur, and alkali metal in the proportion 5 : 2 : 5. (5) All the uranium is present as trioxide. (6) One of the alkali atoms is more loosely combined than the others. When this is removed, the yellow, intermediate compound is produced; it is feebly acid, and contains uranium, sulphur, and alkali in the proportion 5 : 2 : 4. (7) Treatment with dilute hydrochloric acid eliminates one-half the sulphur from this compound in the form of hydrogen sulphide, and the remainder as the free element; this suggests that uranium red contains a disulphide residue which acts as the carrier of the loosely attached alkali atom. (8) In the uranium alkali residue, $5\text{UO}_3, 2\text{R}_2\text{O}$, the four alkali atoms may be replaced by the alkaline earths without altering the chemical character of the compound; the five molecules of uranic acid are therefore grouped in one complex, which takes part, as such, in reactions.

In the author's opinion, the formulæ, $\text{HS}\cdot\text{S}\cdot\text{U}(\text{OH})(\text{O}\cdot\text{UO}_2\cdot\text{OR})_4$ and $\text{RS}\cdot\text{S}\cdot\text{U}(\text{OH})(\text{O}\cdot\text{UO}_2\cdot\text{OR})_4$, represent the yellow, parent compound and uranium red respectively.

M. O. F.

Action of Hydrogen on Bismuth Monosulphide. By HENRI PÉLABON (*Compt. rend.*, 1901, 132, 78—80).—The author has investigated the action of hydrogen on various masses of bismuth monosulphide, and on mixtures of the monosulphide and bismuth, and the action of hydrogen sulphide on bismuth, with a view to determine the conditions of equilibrium. With hydrogen and bismuth sulphide at 610° , if R is the ratio of the weight of the unaltered sulphide to the total weight of the unaltered sulphide and the reduced bismuth, and ρ

is the ratio of the mass of hydrogen sulphide to the total mass of the gas, it is found when R increases from 0.89 and tends towards 1, ρ remains practically constant at about 0.893.

With hydrogen sulphide and bismuth, ρ tends regularly towards zero as R tends to zero, and when the weight of bismuth in a tube of 6 c.c. capacity exceeds 1 gram, ρ is practically proportional to R .

With hydrogen and a mixture of bismuth and bismuth sulphide, ρ increases very regularly as R increases. At 610°, equilibrium is attained in about 20 minutes, and it is immaterial whether the bismuth and bismuth sulphide are mixed or are kept in different parts of the tube.

When the temperature is between the melting points of bismuth and bismuth sulphide, the value of ρ for a given value of R is not the same when hydrogen sulphite acts on bismuth as when hydrogen acts on bismuth sulphide. In the former case, the film of bismuth sulphide formed on the surface of the metal interferes with the reaction, in the latter, the value of ρ at 440° is independent of the mass of bismuth sulphide, as the theory of dissociation indicates in the case of partially heterogeneous systems.

C. H. B.

Mineralogical Chemistry.

Colours of Minerals. By K. VON KRAATZ-KOSCHLAU and LOTHAR WÖHLER (*Zeit. Kryst. Min.*, 1900, 33, 632—636; from *Tsch. Min. Mitth.*, 1899, 18, 304—333, 447—468).—When certain minerals are ignited, the loss of colour is accompanied by a smell of burning organic matter and the production of carbon dioxide, together with, in many cases, a phosphorescence of the mineral lasting only so long as the colour and smell are observable. On these grounds, it is considered that the following minerals may be coloured by organic matter: fluor, apatite, barytes, celestite, anhydrite, salt, calcite, zircon, smoky quartz, amethyst, amazon stone, rubellite and topaz. Several determinations are given of the amount of carbon and hydrogen present; the following may be selected as examples for different minerals:

	C.	H per cent.
Fluor (blue and green) from Cumberland	0.009	0.002
Anhydrite	0.02	0.011
Zircon from Arendal	0.016	0.013
Smoky quartz	0.04	0.0073
Amethyst.....	0.009	0.005
Amazon stone	0.05	0.0145
Topaz from Brazil	0.0076	0.0098

The small amounts of ammonia obtained on heating zircon and smoky quartz are probably derived from organic substances.

Colours which are not destroyed by heat must be due to inorganic substances; those possibly due to chromium, titanium, nickel, manganese

and iron are considered. The colour of melanite and of black anatase appears to be due to titanium sesquioxide (Ti_2O_3). L. J. S.

Colour of Zircon. By GIORGIO SPEZIA (*Zeit. Kryst. Min.*, 1900, 33, 636; from *Atti R. Accad. Sci. Torino*, 1899, 34, 638—642. Compare preceding abstract).—The author long ago stated that the red colour of zircon from Ceylon is due to the presence of ferric oxide. Recent experiments support this view, and prove that Kraatz and Wöhler's view is incorrect. The loss in colour on heating is explained by the reduction of ferric oxide by organic matter. L. J. S.

Colouring Matter of Smoky Quartz. By J. KOENIGSBERGER (*Zeit. Kryst. Min.*, 1900, 33, 637; from *Tsch. Min. Mitth.*, 1899, 19, 148—154. Compare preceding abstracts).—The conclusions of Kraatz and Wöhler are adversely criticised, and their observations are carefully repeated for rose fluor and smoky quartz. After allowing for various sources of error, the amounts of carbon and hydrogen determined are only about one-tenth of those found by Kraatz, and even these are probably too high. Kraatz and Wöhler's statement that smoky quartz contains no titanium is confirmed; the colour cannot therefore be due to the presence of titanium sesquioxide as suggested by Weinschenk (*Abstr.*, 1896, ii, 654). L. J. S.

Colours of Minerals. By ERNST WEINSCHENK (*Zeit. Kryst. Min.*, 1900, 33, 638; from *Tsch. Min. Mitth.*, 1899, 19, 144—147. Compare preceding abstracts).—Arguments are given against the supposition that the colours of certain minerals are due to organic matter (compare *Abstr.*, 1896, ii, 654). L. J. S.

Native Tellurium from Hannan's District, Western Australia. By R. W. EMERSON MACIVOR (*Chem. News*, 1900, 82, 272).—Tellurium has been found associated with pyrites from Hannan's district, Western Australia; it has a finely-granular, white, metallic appearance. Analysis gave:

Te.	Au.	Total.
96.935	2.399	99.334

D. A. L.

Alteration of Pyrites by Underground Water. By JOHN WILLIAM EVANS (*Min. Mag.*, 1900, 12, 371—377).—Water containing oxygen and calcium carbonate may act on pyrites in accordance with the following equation: $4\text{FeS}_2 + 15\text{O}_2 + 3\text{H}_2\text{O} + 8\text{CaCO}_3 = (\text{Fe}_2\text{O}_3)_2(\text{H}_2\text{O})_3 + 8\text{CaSO}_4 + 8\text{CO}_2$. Here there is no loss of iron, and the molecular volume of the resulting limonite is almost exactly equal to that of the original pyrites. From this it is concluded that the solidity of rocks containing much pyrites will not be affected by underground waters containing a sufficient amount of calcium carbonate in proportion to free oxygen. When distilled water is allowed to drop onto pyrites, ferrous sulphate and sulphuric acid are formed, but the pyrites remains bright even after several months. With ordinary river water containing calcium carbonate, limonite and gypsum are formed as indicated by the above equation. Similar results were obtained with marcasite, zinc-blende, and copper-

pyrites. Arsenides (niccolite &c.) are altered to arsenates when allowed to remain in distilled water, but in this case the presence of calcium carbonate seems to retard the action.

L. J. S.

Conchite, a New Form of Calcium Carbonate. By AGNES KELLY (*Sitzungsber. Akad. München*, 1900, 187—194; *Min. Mag.*, 1900, 12, 363—370).—A description is given of a new form of calcium carbonate, which is optically uniaxial and negative, but with refractive indices different from calcite, and no cleavage or twinning. Sp. gr. 2·87. It occurs as various animal secretions (for example, those of molluscs, &c., formerly supposed to consist of aragonite), the “fur” of kettles, and in the hot springs of Carlsbad, Bohemia (compare ktypeite, Abstr., 1898, ii, 604). It crystallises from hot solutions, whilst calcite crystallises from cold solutions. At a temperature of 300—310°, it is altered into calcite, whilst the change of aragonite to calcite takes place at 405°.

The shell of *Cardium edule* consisting of conchite was found to contain CaO, 54·63; CO₂, 42·45 = 97·08, the difference being organic matter and a possible trace of sodium chloride. In the shell of *Cyrena*, the amount of CaO corresponds to 97·2 per cent. CaCO₃.

An amorphous form of calcium carbonate is also described.

L. J. S.

Artificial Preparation of Polyhalite. By E. E. BASCH (*Sitzungsber. Akad. Wiss. Berlin*, 1900, 48, 1084).—Polyhalite has been artificially prepared in two ways. In the first, syngenite and epsomite were placed in a solution containing sodium, potassium and magnesium chlorides and magnesium sulphate, and heated at 56° for some hours, when the syngenite is converted into polyhalite, [Ca₂K₂Mg(SO₄)₄·2H₂O]. In the other method, potassium sulphate dissolved in water is shaken with gypsum, the resulting paste of syngenite is mixed with crystalline magnesium sulphate and chloride, and kept at 56° until sufficient water has been lost by evaporation; the mixture is then filtered and the precipitate washed with alcohol.

R. H. P.

A Rhombic Pyroxene from South Africa. By HERRERT LISTER BOWMAN (*Min. Mag.*, 1900, 12, 349—353).—Determinations are given of the characters of some clear, transparent, irregular fragments of a bright green colour from the diamond washings of South Africa. There is a perfect prismatic cleavage with an angle of 88°0'; less perfect cleavages are *a*(100) and *b*(010). Sp. gr. 3·199. The optical characters and the following approximate analysis point to the mineral being enstatite:

SiO ₂ .	FeO.	MnO.	Al ₂ O ₃ .	Cr ₂ O ₃ .	MgO.	Total.
56·0	5·0	0·5	2·5	0·6	36·5	101·1

L. J. S.

[Mineral Analyses.] By HAROLD W. FAIRBANKS (*Zeit. Kryst. Min.*, 1900, 33, 658; from *Bull. Dept. Geol. Univ. California*, 1896, 2, 1—92. Compare Abstr., 1897, ii, 55).—In a geological paper, the following analyses are given of augite (I), feldspar (II), and analcite

(III) from an augite-teschenite from Point Sal, Santa Barbara Co., California.

	SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	CaO.	MgO.	K ₂ O.	Na ₂ O.
I.	46.59	9.69	1.03	4.75	21.38	13.89	1.23	
II.	52.72	30.46	—	—	11.01	—	0.42	3.70
III.	54.40	23.04	—	—	0.21	—	0.19	13.33
			Ignition.	Total.	Sp. gr.			
			I.	1.22	99.78	2.338		
			II.	1.44	99.75	2.63—2.67		
			III.	8.46	99.63	2.261		

L. J. S.

Mode of Occurrence of Topaz near Ouro Preto, Brazil. By ORVILLE A. DERBY (*Amer. J. Sci.*, 1901, [iv], 11, 25—34).—The statement that the topaz of Ouro Preto occurs in talcose or chlorite-schist is incorrect. It occurs, usually in nodules, in a clayey matrix which has resulted from the decomposition of a mica-schist, the latter having probably been derived from an eruptive rock of the augite- or nepheline-syenite groups, in which the topaz was crystallised in drusy cavities. Associated minerals are rutile, tourmaline, euclase, florencite (*Abstr.*, 1900, ii, 601), &c.

L. J. S.

Albite from Amelia, Virginia. By FRANZ ERBEN and L. CEIPEK (*Tsch. Min. Mitth.*, 1901, 20, 85).—The following analysis is of rather cloudy cleavage fragments of albite, which has been examined optically by F. Becke (*ibid.*, 19, 321). Formula, Ab₁₉An₁:

SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	MnO.	CaO.	MgO.	K ₂ O.	Na ₂ O.	Li ₂ O.	Total.
68.96	20.26	0.23	trace	1.05	0.22	0.11	9.89	trace	100.72

L. J. S.

Constitution of Andalusite and of Disthene. By KARL ZULKOWSKI (*Monatsh.*, 1900, 21, 1086—1094. Compare *Abstr.*, 1900, ii, 595).—When these two minerals are heated with a large excess of potassium carbonate until constant in weight, the loss of carbon dioxide in each case indicates that 1.5 molecules of alkali become united with the mineral (SiO₂, Al₂O₃). These results do not agree with Groth's views on the molecular structure of the two minerals and necessitate the doubling of the molecular formulæ to 2SiO₂, 2Al₂O₃.

J. J. S.

[**Mineral Analyses.**] By WALDEMAR CHRISTOFER BRÜGGER (*Skrifter Vid.-Selsk. Christiania, Math.-natur. Kl.*, 1898 (1897), No. 6, 90—100).—The following mineral analyses by V. Schmelek are given in a petrological paper (pp. 1—377) describing the dyke-rocks in the Christiania district. Heumite is the name given to a dyke-rock from Heum, consisting of hornblende and felspar, with some biotite, and smaller amounts of nephelite, sodalite, diopside, &c. The hornblende (anal. I; also fluorine 0.31; 1.51 per cent. of apatite has been deducted) is intermediate between basaltic hornblende and barkevikite, but nearer the former; sp. gr. 3.2—3.3. The felspar consists mainly of anorthoclase of sp. gr. 2.62—2.64 (anal. II); after deducting 3.09 per

cent. of hornblende and 7.00 per cent. of nephelite, the composition of the pure anorthoclase is given under III. The bulk analysis of the rock gave the results under IV (also P_2O_5 , 0.48 per cent.). Hornblendite from Brandberget, consisting essentially of hornblende, gave the results under V, and is thus very similar in composition to the hornblende under I. Numerous other rock analyses are given in the paper :

	SiO ₂ .	TiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	MnO.	CaO.	MgO.
I.	40.29	4.37	10.93	7.84	9.70	0.15	11.83	9.78
II.	62.32	—	21.90	0.51	—	—	2.52	0.32
III.	65.59	—	21.37	—	—	—	2.29	—
IV.	47.10	1.75	16.42	4.63	7.04	0.36	7.64	5.00
V.	37.90	5.30	13.17	8.83	8.37	—	10.75	9.50

	K ₂ O.	Na ₂ O.	Loss on ignition.	Total.
I.	1.61	3.19	—	100.00
II.	1.19	9.97	1.59	99.32
III.	0.90	9.85	—	100.00
IV.	3.47	6.36	0.40	100.65
V.	2.12	2.35	1.40	99.69

L. J. S.

Analyses of Rock-forming Minerals from the Tatra Mountains. By L. GORAZDOWSKI (*Zeit. Kryst. Min.*, 1900, 33, 656—658; from *Pamiętnik. Fizyograficzny*, 1898, 15).—Muscovite from various granites gave analyses I—III, that from gneiss gave IV; measurements of the optic axial angle are given. Biotite from granite gave V, and from biotite-garnet-schist VI. Garnet from the last rock gave VII. Red porphyritic crystals of orthoclase, and greenish albite from the ground-mass of a granite, gave VIII and IX respectively. Hornblende from a diorite gave X, and from an amphibolite XI :

	SiO ₂ .	TiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	MnO.	CaO.	MgO.	K ₂ O.	Na ₂ O.	H ₂ O.	Total.
I.	38.85	3.94	30.64	2.03	—	—	0.69	trace	9.50	1.70	13.27	100.63
II.	45.36	2.70	28.35	2.60	—	—	0.18	trace	9.23	1.89	9.99	100.30
III.	42.27	2.66*	31.57	2.63	—	—	1.06	0.86	10.05	3.49	6.07	100.68
IV.	41.27	1.67	33.94	0.95	—	—	0.29	trace	9.98	2.43	9.39	99.92
V.	34.53	2.26	19.88	7.50	14.16	—	0.26	5.01	7.55	0.82	6.03	98.00
VI.	35.12	2.04	19.52	8.08	15.69	—	0.47	4.77	7.25	0.84	6.33	100.11
VII.	34.41	1.01	20.34	34.33	—	5.72	1.84	1.80	—	—	0.55	100.00
VIII.	63.91	—	17.71	trace	—	—	0.33	—	13.22	3.10	0.68	98.95
IX.	65.23	—	19.18	trace	—	—	1.81	trace	2.16	7.94	2.10	98.42
X.	46.39	—	8.11	4.64	9.68	—	14.17	11.82	0.63	0.82	2.30	98.56
XI.	44.86	—	11.94	8.85	12.34	—	10.70	7.68	0.99	1.16	1.84	100.36

L. J. S.

Microperthite from Wisconsin. By SAMUEL WEIDMANN (*Zeit. Kryst. Min.*, 1900, 33, 658; from *Bull. Wisconsin Geol. and Nat. Hist. Survey*, 1898, 3).—In a geological paper on the pre-Cambrian igneous rocks of the Fox River Valley, Wisconsin, the following analysis by Tolman is given of microperthite which occurs as a constituent of rhyolite. It consists of albite and oligoclase-andesine with extinction

* Including ZrO_2 .

angles on (010) of 19° and $5-7^\circ$ respectively; these have probably been derived by the alteration of a single plagioclase.

SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	CaO.	K ₂ O.	Na ₂ O.	Total.
62·57	18·12	1·32	5·52	5·11	7·20	99·84

L. J. S.

Gaseous Products Liberated by the Action of Heat on some Igneous Rocks. By ARMAND GAUTIER (*Compt. rend.*, 1901, 132, 58—65).—Igneous rocks such as granite, porphyry, ophite, and lherzolite, when heated at about 1000° in a vacuum, yield from 2500 c.c. to 5500 c.c. of gas per kilogram, in addition to from 7 to 17 grams of water. The gas consists chiefly of hydrogen, carbon dioxide, and carbon monoxide, with some methane, and except in the case of porphyry, some hydrogen sulphide. In the case of lherzolite, carbon dioxide is the chief constituent, and the proportion of hydrogen sulphide is more than half as high again as the proportion of hydrogen. The total volume of water vapour and gas emitted by these rocks at 1000° is not less than 100 times the volume of the rock itself, and this fact has an important bearing on volcanic action. C. H. B.

Production of Hydrogen in Igneous Rocks. Action of Steam on Ferrous Salts. By ARMAND GAUTIER (*Compt. rend.*, 1901, 132, 189—194).—A study of the action of heated chalybite on carbon dioxide or steam confirms the results obtained by Tilden (*Abstr.*, 1898, ii, 383). Owing to the presence of traces of sulphides and nitrogenous compounds in the mineral employed, the gaseous product contained small quantities of hydrogen sulphide and ammonia. Ferrous sulphide free from iron, is transformed by steam into the magnetic oxide of iron, the gases evolved consisting of a mixture of hydrogen and hydrogen sulphide.

Analogous results are obtained with ferruginous siliceous rocks (porphyrites and granites); these mineral specimens contain water which is evolved only at a red heat, and at this temperature acts on the ferrous compounds yielding hydrogen. A specimen of ophitic rock, maintained at red heat until its gaseous constituents are entirely removed, was made to yield fresh quantities of gas by heating it in a current of steam; in this case, the product was a mixture of methane, nitrogen, hydrogen, and the oxides of carbon. G. T. M.

Ceylon Rocks and Graphite. By ANANDA K. COOMÁRA-SWÁMY (*Quart. J. Geol. Soc.*, 1900, 56, 590—614. Compare *Abstr.*, 1899, ii, 500).—With the exception of recent deposits (gem-gravels, &c.), Ceylon is probably entirely composed of ancient crystalline rocks, mainly granulites, in which veins of graphite often occur. The following analyses of rock-forming minerals by S. Hastings and Shepherd are given. Hypersthene from a quartz-norite gave the results under I (mean of two duplicate analyses which, however, differ considerably). Pale-greenish mica (anal. II; also F, 0·78, traces of Fe₂O₃ and organic matter), with the optical characters of biotite, occurs with sky-blue apatite and sahlite in a crystalline limestone. Some rocks from Galle are peculiar in being composed of scapolite, wollas-

tonite in large ophitic plates (analyses III and IV), quartz, a pale green pyroxene (shown by anal. V to be mangan-hedenbergite), &c.

	SiO ₂ .	Al ₂ O ₃ .	FeO.	MnO.	CaO.	MgO.	K ₂ O.	Loss on ignition.	Total.	Sp. gr.
I.	50.45	0.72	28.41	—	—	21.05	—	—	100.63	3.55
II.	40.72	26.38	—	—	—	14.27	10.36	7.63	99.81	2.57
III.	51.28	2.01	1.34	—	45.55	—	—	not est.	100.18	2.76
IV.	54.59	1.77	0.70	—	40.85	—	—	2.29	100.20	2.78
V.	50.91	1.78	19.91	2.64	24.41	0.58	—	—	100.23	3.377

L. J. S.

Chemical Study of the Glaucophane-Schists. By HENRY S. WASHINGTON (*Amer. J. Sci.*, 1901, [iv], 11, 35—59).—A review is given of the literature of several occurrences of glaucophane-schists, and many new analyses and petrological descriptions are added. These rocks may be divided into two main groups, a basic and an acid; the former are composed chiefly of glaucophane and epidote, and have been derived by the regional or contact metamorphism of igneous rocks of the gabbro family; those of the rarer acid division are composed mainly of quartz and glaucophane with mica, and have been derived from sedimentary rocks. The following analysis is given of glaucophane, sp. gr. 3.11, isolated from a quartz-mica-glaucophane-schist from the island of Syra, Greece :

SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	MnO.	CaO.	MgO.	Na ₂ O.	K ₂ O.	H ₂ O.	Total.
57.67	11.07	3.20	9.68	0.06	0.95	9.85	6.80	0.42	0.48	100.18

L. J. S.

[Fassaite from Syria.] By L. FINCKH (*Zeit. Kryst. Min.*, 1900, 33, 651; from *Zeit. Deutsch. geol. Ges.*, 1898, 50, 79—146).—The gabbros and serpentines of northern Syria are described. A fassaite-fels occurs as a contact product of serpentine in the Kurden mountains. Pure cleavage flakes of fassaite gave the following results on analysis; the angle of optical extinction on (010) is 30°, and there is a diallage-like parting parallel (100) :

SiO ₂ .	Al ₂ O ₃ .	FeO.	CaO.	MgO.	Ignition.	Total.
48.72	18.50	3.05	20.89	6.82	2.23	100.21

L. J. S.

Analysis of the Kesen Meteorite. By JOHN M. DAVISON (*Chem. Centr.*, 1901, i, 274; from *Proc. Rochester Acad. Sci.*, 1900, 3, 201—202).—I, the portion (31.68 per cent.) soluble in hydrochloric acid. II, the insoluble portion (51.79 per cent.). III, the metallic portion attracted by a magnet (16.53 per cent.). IV, the composition of the whole :

	SiO ₂ .	Fe ₂ O ₃ .	Al ₂ O ₃ .	CaO.	MgO.	Na ₂ O.	K ₂ O.
I.	7.35	45.32	1.63	1.68	41.58	—	—
II.	64.15	6.97	5.35	3.49	17.80	1.27	0.05
III.	—	—	—	—	—	—	—
IV.	36.24	18.04	3.34	2.35	22.54	0.34	0.01

	P ₂ O ₅ .	S.	Fe.	Ni.	Co.	Total.
I.	0·10	0·19	—	2·00	0·17	99·92†
II.	—	—	—	—	—	99·08
III.	0·12*	1·56	87·22	10·05	0·46	99·41
IV.	0·36	1·53	13·00	2·13	0·12	100·00

* Phosphorus.

† Less 0·10 O for S.

L. J. S.

Chemical Investigations in the Red Sea. By KONRAD NATTERER (*Monatsh.*, 1900, 21, 1037—1060).—Detailed analyses are given of samples of water and soil, and soundings from the sea bed collected during a voyage of the *Pola* in the southern half of the Red Sea during 1897 and 1898 (compare Abstr., 1899, ii, 501). The waters were examined as to specific gravity and amount of organic matter; the specimens from the sea bed were analysed mainly for magnesium and calcium carbonates.

J. J. S.

Physiological Chemistry.

Capacity of Man to Adapt Himself to High and Low Temperatures. By MAX RUBNER (*Arch. Hygiene*, 1900, 38, 120—147).—A large number of observations are recorded on human beings at different temperatures of the surrounding air, with and without clothing. The most striking result is the comparative constancy of the gaseous exchanges in the lung; the main adaptation to the altered surroundings is carried out by the skin in the loss of water.

W. D. H.

Skin Activity in Europeans and Negroes. By MAX RUBNER (*Arch. Hygiene*, 1900, 38, 148—159).—Apart from considerations of diet, which are treated of especially in relation to its heat value in warm climates, the principal point made in the paper as the result of observations on skin activity in negroes and Europeans is that but little difference is observable in the two classes. Observations at different temperatures of the surrounding air and with different kinds of clothing are recorded.

W. D. H.

Chemical Composition of New-born Children. By WILLIAM CAMERER, jun., and FRIEDRICH SÖLDNER (*Zeit. Biol.*, 1900, 40, 529—534).—Further experiments to show that the ash of milk and of the offspring do not correspond as Bunge states. Besides the ash, quantitative experiments are given to show the proportion of the various organic constituents in new-born children. The main results are as follows:

	Water.	Fat.	Ash.	Proteid and Ex- trac- gelatin. tives.	C.	H.	N.	
Two male children ...	71	13	2·7	12	1·2	16·6	2·4	2·0
Two female children...	72	12	2·6	11	1·6	15·6	2·3	1·9

W. D. H.

Composition of the Ash of Milk and of the New-born Child. By CORNELIA DE LANGE (*Zeit. Biol.*, 1900, 40, 526—528).—The correspondence of the composition of the ash of milk and offspring described by Bunge is not altogether supported by the results obtained by Hugounenq (*Abstr.*, 1899, ii, 503, 682), and of Camerer and Söldner (*Abstr.*, 1900, ii, 290). In the present investigation, the methods of Camerer and Söldner were used; human milk and a still-born infant were the subjects of the experiments. It will be seen in the following table that the numbers, which are percentages of the ash obtained, differ considerably from those of Camerer and Söldner:

	Ash of infant.		Ash of human milk.	
	Present research.	Söldner.	Present research.	Söldner.
K ₂ O	6.5	7.8	19.9	31.4
Na ₂ O.....	8.8	9.1	29.6	11.9
CaO	38.9	36.1	12.9	16.4
MgO.....	1.4	0.9	2.9	2.6
Fe ₂ O ₃	1.7	0.8	0.25	0.16
P ₂ O ₅	37.6	38.9	17.9	13.5
Cl ₂	6.3	7.7	21.3	20.0

W. D. H.

[Obesity in Relation to Respiration]. By ARTHUR SCHATTENFROH (*Arch. Hygiene*, 1900, 38, 93—113).—The observations relate principally to loss of water by the skin. They show that at rest the loss of water per square unit of the body, as the temperature of the air is raised, is about 40 per cent. greater than for thin people. The difference is much more marked during work.

W. D. H.

Cause of Apnœa. By LÉON FREDERICQ (*Bull. Acad. Roy. Belg.*, 1900, 464—482).—Much discussion has occurred in relation to the question whether apnœa is of nervous or chemical origin. The present results are in favour of the latter view. Experiments in crossed cerebral circulation show there is true chemical apnœa, but the increase in oxygen tension of the blood is so slight that this cannot be the cause of the phenomenon. Moreover, the tension can be increased threefold without producing apnœa. It is rather to be attributed to decrease in carbon dioxide, the amount of which sinks to less than half the normal. Intravascular injections of sodium hydroxide do not increase markedly the alkalinity of the blood in the dog. Such injections do not diminish the tension of carbon dioxide, and apnœa does not result.

W. D. H.

The Toxicity of Expired Air. By EMMANUEL FORMÁNEK (*Arch. Hygiene*, 1900, 38, 1—66).—An elaborate research, with references to former work, especially that of Brown-Séquard and D'Arsonval, who are mainly responsible for a prevalent opinion that expired air contains certain specific poisonous substances, possibly of an alkaloidal nature. The present research shows that ammonia can frequently be detected in the expired air, but this is not added to the air in the lungs, but in the mouth, as the result of putrefactive changes, especially in carious teeth. No specific poison exists in the true expired air except carbon dioxide.

W. D. H.

NOTE.—No reference is made to the work of Haldane and Smith (Abstr., 1892, 1502 ; 1893, ii, 223), who obtained the same result.

W. D. H.

Permeability of the Red Blood Corpuscles for $\overline{\text{NO}_3}$ and $\overline{\text{SO}_4}$ Ions. By HARTOG J. HAMBURGER (*Proc. K. Akad. Wetensch. Amsterdam*, 1900, 371—374).—If red blood corpuscles previously treated with carbon dioxide in dextrose solution are placed in a solution of sodium chloride, the latter becomes alkaline, owing to the $\overline{\text{CO}_3}$ ions passing out of the cells and replacing the $\overline{\text{Cl}}$ ions. For every $\overline{\text{CO}_3}$ ion that leaves a cell two $\overline{\text{Cl}}$ ions enter it, so that the corpuscle swells. On similar grounds, the author concludes that the red blood corpuscles are permeable for $\overline{\text{NO}_3}$ and $\overline{\text{SO}_4}$ ions.

J. C. P.

Calcium and Sodium Citrates in the Coagulation of the Blood, Lymph, and Milk. By LUIGI SABBATANI (*Atti R. Accad. Sci. Torino*, 1901, 36, 27—53).—Experiments have been made on the action of normal sodium citrate in rendering blood non-coagulable, and it is found that to bring about this condition in blood which has been removed from the body of the animal, 3 mol. of the sodium citrate are required for each atom of calcium contained in the blood. When the citrate is intravenously injected, however, the necessary proportion is raised to about five times the above, from which it is concluded that in this case the citrate not only acts on the soluble calcium salts in the blood, but diffuses into the tissues and fixes the calcium salts found both there and in the other liquids of the organism. Blood which has been rendered non-coagulable owing to the presence of sodium citrate is again made coagulable by the addition of calcium salts, the quantity of calcium required to bring about this result increasing with the amount of citrate present. Similar considerations hold for the coagulability of lymph and of milk, the results in the latter case supporting Vaudin's hypothesis that the citric acid normally present in milk assists in maintaining in solution the calcium salts contained therein. Further, the experiments lend confirmation to the view that the presence of calcium is indispensable for the coagulation of blood, lymph, and milk, and show also that the calcium must be present in a chemically active condition, that is, in the form of ions.

T. H. P.

Mechanism of the Actions of Diastases. By MAURICE HANRIOT (*Compt. rend.*, 1901, 132, 212—215. Compare Abstr., 1897, ii, 378).—The hydrolysis of glyceryl esters by the lipase contained in the serum of the horse is an action which is arrested by the presence of excess of acid, but not by that of glycerol; this fact confirms the view that the reaction is due to the formation of an unstable compound of the acid with the enzyme.

The hydrolytic action appears to be a balanced reaction, and the inverse change is effected when a solution containing 5 parts of glycerol, 2 parts of butyric acid, and an excess of neutralised serum is maintained at 37°, the loss of acidity being 54 per cent. in 1½ hours.

Under these conditions the acidity of a solution of glycerol and butyric acid containing no serum remains constant, and this is also the case when the serum has been previously boiled, or when it is added to a solution which is free from butyric acid.

The lipase also promotes the esterification of the mineral acids; in the case of the acids of the acetic series, the amount of combination increases with the molecular weight of the acid. G. T. M.

Physiology of Glands. By LEON ASHER and WILLIAM D. CUTTER (*Zeit. Biol.*, 1900, 40, 535—559).—The observations were made on the salivary glands. Various crystalloids were introduced into the blood and the effect noted. Thus sugar acts only in producing hydræmic plethora, sodium chloride passes in varying proportions into the secretion, and urea is a mere stimulator of secretory activity. The main idea underlying the work is the same as that in the authors' previous work on lymph formation. They consider they have proved their point concerning the individuality and selective activity of different groups of secreting cells. W. D. H.

Salivary Secretion. By ALBERT P. MATHEWS (*Amer. J. Physiol.*, 1901, 4, 482—499).—The whole theory of secretory nerves is combated, and atropine (which has hitherto been regarded as affording proof of the existence of such nerves) is stated to act directly in the secreting cells, and not on the nerves at all. W. D. H.

Osmotic Pressure of Dog's Submaxillary Saliva. By PIERRE NOLF (*Bull. Acad. Roy. Belg.*, 1900, 960—977).—The osmotic pressure of dog's saliva obtained by excitation of the chorda tympani is variable ($\Delta = 0.195^\circ$ to 0.396°); the saliva secreted spontaneously is more dilute ($\Delta = 0.109^\circ$ to 0.266°). The tension is due almost exclusively to the salts. The tension rises when external pressure is opposed to the salivary flow. W. D. H.

[Value of Alcohol as a Source of Muscular Energy.] By AUGUSTE CHAUVEAU (*Compt. rend.*, 1901, 132, 65—70; 110—114).—The experiments recorded show that alcohol is little, if at all, used as a source of muscular energy. If an isodynamic quantity is substituted for sugar in a diet, the result is unfavourable both as regards the subject of the experiment as a whole and as regards the quantity of work he can do. W. D. H.

Fat Absorption. By IMMANUEL MUNK (*Chem. Centr.*, 1901, i, 52, from *Centr. Physiol.*, 1900, 14, 409—412).—In reference to work of Henriques and Hansen (*Abstr.*, 1900, ii, 668), it is pointed out that if a mixture of fat and paraffin is given to an animal, there is no ground for believing that a uniform emulsion is formed in the intestine. The paper also contains polemical matter in answer to Pflüger (*ibid.*, ii, 667). W. D. H.

Sugar Formation from Fat. By HARTOGH and O. SCHUMM (*Chem. Centr.*, 1901, i, 53; from *Arch. exp. Path. Pharm.*, 1900, 45 11—45).—In animals in which diabetes had been induced by phloridzin, the relation between the nitrogen and sugar in the urine

indicates that the latter cannot arise from proteid. The conclusion is drawn that the sugar originates from fat. W. D. H

Chemical Composition and Nutritive Value of Different Kinds of Meat. By ADOLF BEYTHIEN (*Zeit. Nahr. -Genussm.*, 1901, 4, 1—9).—Tables giving comparative mechanical and chemical analyses of the various parts of the carcasses of oxen, sheep, and pigs, also including codfish and salt herrings.

The analysis contains no novel details except that the author prefers estimating the water by difference. The proteids were estimated by the Kjeldahl-Gunning method, the nitrogen being multiplied by 6.25. It appears that from an economical standpoint the use of beef (ribs and flank) is preferable to other flesh food. L. DE K.

Metabolism in Horses. By NATHAN ZUNTZ (*Landw. Versuchs-Stat.*, 1901, 55, 117—128).—A reply to Pfeiffer (Abstr., 1900, ii, 554), in which the author maintains that the method employed by himself, in conjunction with Lehmann and Hagemann, is not merely the only satisfactory one for ascertaining the effect of work, including eating, on metabolism, but that it is eminently suited for judging the work of digestion. N. H. J. M.

Asparagine as a Foodstuff. By FRANZ ROSENFELD (*Zeit. Ver. deut. Zuckerind.*, 1900, 1055—1079).—After giving an account of the literature on the feeding of animals with materials of which asparagine forms a part, the author describes his own experiments which were made on a dog. The animal was fed regularly with weighed quantities of various foods, the faeces and urine being collected and examined. The experiments do not lead to any definite conclusions, but seem to confirm the previously observed fact that for carnivorous animals the proteids are better foodstuffs than the amides, in particular than asparagine. T. H. P.

Transformation and Regeneration of Organs. By JACQUES LOEB (*Amer. J. Physiol.*, 1900, 4, 60—68).—In many lower animals (for instance, polyps), parts cut off will regenerate, but change of external conditions will often cause the new growth to be different from the old. This is regarded as due to ionic action, or to the activity of enzymes. W. D. H.

Artificial Parthenogenesis. By JACQUES LOEB (*Amer. J. Physiol.*, 1901, 4, 423—460. Compare Abstr., 1900, ii, 608).—Further experiments are recorded which are confirmatory of the author's views. W. D. H.

[Parthenogenesis.] By YVES DELAGE and MARCEL DELAGE (*Compt. rend.*, 1900, 131, 1227—1229).—The importance attributed to magnesium by Loeb in the production of artificial parthenogenesis has led the authors to determine the proportion of this metal in the ash of the male and female organs in animals; they find 8.8 per cent. in the ash in the male, and 7.8 in the female glands. W. D. H.

Effect of Temperature on the Activity of the Upper Cervical Ganglion. By F. C. EVE (*J. Physiol.*, 1900, 26, 119—124).—The upper temperature limit which paralyses the ganglion in cats is 50°. The lower limit varies from 10° to 18°, but recovery occurs on warming. These temperatures are approximately those which are compatible with recovery in human beings. W. D. H.

NOTE.—No reference is made to the work of Marinesco, or of Goldscheider and Flatau, who have shown that the upper temperature limit (about 47°) is that at which chromatolysis of nerve-cells occurs; or to the work of Mott and Halliburton, who have pointed out that this temperature coincides with the heat coagulation temperature of cell-globulin, and have thus furnished a chemical explanation of death from hyperthermia. W. D. H.

Studies on the Liver. I. Absorption in the Liver. By K. BÜRGER (*Pflüger's Archiv*, 1901, 83, 241—352).—The following conclusions are drawn from experiments on rabbits. Heidenhain's theory of interlobular absorption cannot be correct; absorption occurs much more within the liver lobules. The part played by the lymph vessels is well demonstrated by injecting milk into the bile duct; in a short time, the lymphatics become white. The outflow of bile varies in fairly regular periods of 20—30 minutes. Bile secretion sinks much more rapidly in a hungry than in a feeding animal. The normal pressure in the larger ducts is 75—80 mm. of bile, and is not greater than the pressure in the portal vein. In certain pathological conditions, the pressure increases. If the bile duct is entirely closed, the secretory action of the liver diminishes and necrotic changes may occur in the liver. Physiological salt solution, blood, peptone, urea, sodium glycocholate, diluted ox-bile, solution of bilirubin (slightly), and sugar (greatly) are absorbed at one and a half times the pressure of the bile. W. D. H.

Conversion of Creatine into Creatinine by a Soluble Dehydrating Ferment in the Organism. By ERNEST GÉRARD (*Compt. rend.*, 1901, 132, 153—154).—The cold aqueous extract of the cortex of the kidney of the horse, when mixed with chloroform and creatine and heated at 40°, converts a portion of the base into creatinine, negative results being obtained with the previously boiled extract. The amount of creatinine formed is small, but it was identified with certainty by Weyl's reaction and also by separation in the form of phosphotungstate. The dehydrating action is probably due to a soluble ferment and a similar effect was noticed by Abelous and Ribaut, in the synthesis of hippuric acid as brought about by means of the extract of kidneys (*Compt. rend. Soc. Biol.*, 1900, 52, 543).

G. T. M.

Presence of Free Aspartic Acid in the Animal Organism. By MARTIN HENZE (*Ber.*, 1901, 34, 348—354).—*Tritonium nodosum* possesses a pair of glands each consisting of two parts; the anterior portion has an alkaline reaction and is non-excreting, whilst the posterior portion, when stimulated, excretes an acid fluid which immediately becomes turbid, and deposits a crystalline compound, identified

as aspartic acid. The fluid, when obtained by electrical stimulus, also gives the reaction of peptones. The aspartic acid is present in the fluid before excretion, for a freshly excised gland placed in boiling water to prevent the action of enzymes yields the characteristic copper salt on treatment with cupric acetate; moreover, the acid may be precipitated in a crystalline form within the substance of the gland itself by soaking the organ in alcohol. Aspartic acid, being soluble in salt water, is in all probability employed by the animal in destroying the calcareous shells of the other shell-fish which form its food. G. T. M.

Camphor Excreted by an Animal (Polyzonium). By O. F. COOK (*Chem. Centr.*, 1901, i, 191; from *Science, N.S.*, 1900, 12, 516—521).—The excreta of *Polyzonium rosalbum* have the characteristic odour of camphor. The camphor probably serves as a means of protection. E. W. W.

Quantitative Relationships of Carbohydrates in Diabetic Urine. By HEINRICH ROSIN (*Chem. Centr.*, 1901, i, 227; from *Centr. med. Wiss.*, 1900, 38, 851).—From the quantity of benzoyl esters obtained by Baumann's method, normal urine was calculated to contain 1.5—5.09 grams of carbohydrates, whilst in diabetic urine, after fermentation of the dextrose, 9.17—20.6 grams of carbohydrates still remained. The amount of dextrose does not bear any fixed relationship to that of the carbohydrates determined by means of their benzoyl esters. E. W. W.

Benzoyl Esters and Carbohydrates in Normal and in Diabetic Urine. By VON ALFTHAN (*Chem. Centr.*, 1901, i, 227; from *Centr. med. Wiss.*, 1900, 38, 851—852. Compare preceding abstract).—In the amount of carbohydrates determined by means of the benzoyl esters, animal gum and pentoses are included. Diabetic urines were examined as follows. After estimating the total carbohydrates by Baumann's method, the sugar was fermented and the remaining carbohydrates again converted into benzoyl compounds. The latter were then hydrolysed, and the products treated with alcohol. In this way, the amount of carbohydrates insoluble in alcohol was found to be 6—10 times greater in urines which had not been previously fermented than in those which had. The insoluble portion contained animal gum and glycogen, whilst pentoses and probably isomaltose were present in the portion soluble in alcohol obtained from unfermented urines. E. W. W.

Action of Various Salts on Ciliary and Muscular Movements in Arenicola Larvæ. By RALPH LILLIE (*Amer. J. Physiol.*, 1901, 5, 56—85).—A pure sodium chloride solution destroys ciliary activity, causing liquefaction of the cilia. The injurious effect on muscle in the same animal is less marked. The addition of calcium chloride delays the injurious action on muscle, whilst magnesium chloride is better for this purpose in the case of ciliary movement. Solutions containing no sodium deprive muscle of contractility, but cilia will act well in solutions of other salts, especially magnesium and calcium chlorides in suitable proportions, in the entire absence of sodium. Several other differences are noted with other salts. Such observations weaken a

very general theory that all contractile tissues have a common (? fibrillary) basis of structure.

W. D. H.

Cantharidin and Cantharidin-immunity. By ALEXANDER ELLINGER (*Chem. Centr.*, 1901, i, 54; from *Arch. exp. Path. Pharm.*, 45, 89—109).—Certain animals, like the hedgehog and hen, show great resistance to cantharidin. The present experiments on the hedgehog confirm this. In this animal, doses fatal to other animals have little or no effect, and the substance passes unchanged into the urine. Repeated injection gives rise to chronic nephritis. The resistance of the hedgehog's kidneys to cantharidin is specific, for potassium chromate is as poisonous to these animals as to the rabbit. The hedgehog's skin shows no resistance to the blistering property of cantharidin.

W. D. H.

Action of Chloroform and Ether on the Neurons of Rabbits and Dogs. By HAMILTON WRIGHT (*J. Physiol.*, 1900, 26, 30—41). The bio-physical explanations of narcosis and sleep advanced by Demoor, Lugaro, &c., are combated. The action of the anæsthetics is believed to be bio-chemical. Chloroform is more active than ether. Dogs are more resistant than rabbits, and do not show [histological changes in the nerve-cells until anæsthesia is prolonged for 4 hours.

W. D. H.

Physiological Action of Melanoidin and Spongio-melanoidin. By MAX ROSENFELD (*Chem. Centr.*, 1901, i, 54; from *Arch. exp. Path. Pharm.*, 1900, 45, 51—55).—Melanoidic acid, prepared according to Schmiedeberg's method from fibrin by boiling with hydrochloric acid, when injected intravenously produces convulsions and death. The melanin-like substance which contains iodine, and can be prepared from bath-sponge, is not so poisonous. Both substances passed unchanged into the urine.

W. D. H.

Action of Mucus on the Organism. By ALBERT CHARRIN and MOUSSA (*Compt. rend.*, 1901, 132, 164—166).—Mucus collected from the trachea, and dissolved in dilute solution of sodium carbonate, produces, in rabbits, death by causing intravascular coagulation. The agent is believed to originate from the cells contained in the mucus.

W. D. H.

NOTE.—No mention is made of nucleo-proteid, or of the well-known fact that this substance from most animal cells will produce the same effect.

W. D. H.

Physiological Action of Substances from the Thyroid. By E. VON CYON and AD. OSWALD (*Pflüger's Archiv*, 1901, 83, 199—206).—Thyreoglobulin is regarded as the albuminous substance which holds the iodothyron complex in its molecule. Other constituents of the thyroid which contain iodine have not the physiological characters of iodothyron.

W. D. H.

Synthesis in the Animal Organism. II. Compounds of the Camphor Group. By HERMANN HILDEBRANDT (*Chem. Centr.*, 1901, i, 53—54; from *Arch. exp. Path. Pharm.*, 1900, 45, 110—129. Compare Abstr., 1900, i, 676).—When sabinol (compare Abstr., 1900, i,

402) is administered to dogs or rabbits, it causes vomiting and stupefaction; the urine becomes laevorotatory, reduces Fehling's solution, and after repeated doses contains *p*-cymene and cumic acid. Since the ester of sabinol is hydrolysed in the organism, it is also probable that when oil of savin itself is used, cumic acid is present in the urine. Thujon from *Oleum thujæ* has a poisonous action similar to that of sabinol; the urine does not, however, contain cumic acid, but *potassium thujonoxyglycuronate*, $C_{16}H_{23}O_8K$, may be isolated from it. This salt forms white crystals, melts at 240° , and is dextrorotatory, but not so strongly as thujon itself. After feeding with citral,

$$CMe_2 \cdot CH \cdot CH_2 \cdot CH_2 \cdot \overset{\overset{||}{CH \cdot CHO}}{CMe}$$

from lemon-grass oil, or with geraniol, the urine contains a dibasic acid, $CMe_2 \cdot CH \cdot CH_2 \cdot CH_2 \cdot C(CO_2H) \cdot CH \cdot CO_2H$, which melts at 187° , is optically inactive, and combines with bromine (4 atoms). When, however, the stereoisomeric citral,

$$CMe_2 \cdot CH \cdot CH_2 \cdot CH_2 \cdot \overset{\overset{||}{CHO \cdot CH}}{CMe}$$

is used, only glycuronic acid compounds are found in the urine. Cumic acid is not formed either in the case of citral or of geraniol.

E. W. W.

Physiological Action of Extracts of Nervous Tissues. By WILLIAM D. HALLIBURTON (*J. Physiol.*, 1901, 26, 229—243).—When injected intravenously, saline extracts of nervous tissues produce a fall of arterial pressure. This is neutralised by atropine. These effects are explicable on the assumption that choline is the active agent present, and this view was confirmed by the separation of choline, as platinichloride, from the solutions. These results show that lecithin, especially in the most active part of the nervous system, namely, the grey matter which yields the most active solutions, is in that continual unstable state of chemical equilibrium called metabolism.

W. D. H.

Veratrine-like Action of Glycerol. By H. WILLOUGHBY LYLE (*Proc. Physiol. Soc.*, 1901, xxvi).—Cleghorn finds that extracts of sympathetic ganglia produce a fall of blood pressure (*Abstr.*, 1899, ii, 569). This Halliburton (see preceding abstract) attributes to choline. Glycerol, however, which was mainly used by Cleghorn to make his extracts, is not physiologically inactive. It produces a fall of arterial pressure which is not abolished by atropine, and it has a veratrine-like action on striped muscle, which was incorrectly attributed by Cleghorn to some substance derived from the ganglia. This action of glycerol on muscle has been previously noted by Langendorff (*Du Bois Reymond's Archiv*, 1891, 480).

W. D. H.

Physiological Relations of Intermittent Albuminuria. By ALBERT CHARRIN (*Compt. rend.*, 1900, 131, 1234—1236).—Two cases of intermittent albuminuria show that the amount of albumin varies with the toxicity, density, and cryoscopic characters of the urine, and with the blood pressure. The explanation of such cases is that they have partly a chemical (disorder of nutrition) and partly a physical (circulatory pressure) origin.

W. D. H.

Chemistry of Vegetable Physiology and Agriculture.

Fermentation Experiments with Various Yeasts and Sugars.

By PAUL LINDNER (*Chem. Centr.*, 1901, i, 56—57; from *Woch. Brau.*, 17, 713—716).—In these experiments, 21 kinds of sugar and allied compounds were treated with various yeasts of widely different fermenting powers. The mixture of the substance with yeast and water was placed in a hollow object glass, and the air excluded from the cavity by means of a cover-glass. Arabinose, xylose, rhamnose, and the mixture of *l*-sorbose and *d*-galactose were not fermented by any yeast. *d* Glucoheptose only underwent a slight fermentation in one case, and trehalose was not affected by most of the yeasts. Dextrose resisted the action of only three kinds; *d*-mannose and *d*-galactose were fermented by isolated species which also decomposed dextrose, but levulose was attacked by all those yeasts which fermented dextrose. Inulin was, generally speaking, readily attacked by most of the yeasts. Dextrin (acid-dextrin) was decomposed by several moulds and also by several varieties of yeast including the beer yeast, *Saccharomyces pombe*, *S. octosporus* and *S. mellacei*. Sucrose was fermented by the yeasts of low fermenting power and by the polygonal yeasts, milk sugar by three yeasts from Armenian mazun, Weigmann's yeast, *Sachsia suaveolens*, and possibly by *Monilia variabilis*, and melibiose by some yeasts slightly and by others more strongly. Raffinose did not behave in every case like sucrose; the experiments gave no indication of the presence of the enzyme raffinase. The mixture of real and false tagatose was only moderately attacked by one yeast; false tagatose gave negative results in every case. α -Methylglucoside was fermented by many of the yeasts, but β -methylglucoside by few. According to Fischer's theory, since these compounds are related as object to image, the decomposing agents must be similarly related, hence those kinds of yeasts which ferment both compounds together should contain two different enzymes.

E. W. W.

Arsenic Mould (*Penicillium Brevicaule*). By B. GOSIO (*L'Orosi*, 1900, 23, 361—377).—See this vol., ii, 193.

Presence of a Proteolytic Ferment in Germinated Seeds and its Action. II. By WL. BUTKEWITSCH (*Chem. Centr.*, 1901, i, 190; from *Ber. bot. Ges.*, 1900, 18, 358—364. Compare Abstr., 1900, ii, 744).—The ferment contained in germinated seeds of lupin and other plants may be extracted by glycerol, and is precipitated from the extract by alcohol.

By the action of the ferment on conglutin, leucine, and tyrosine are formed, but asparagine could not be detected, and its absence is in accordance with E. Schulze's theory that it is not a primary product of the decomposition of albumin.

E. W. W.

Digestion in the Ascidia of Nepenthes. By GEORGES CLAUTRIAU (*Chem. Centr.*, 1901, i, 57—58; *Mém. Acad. Roy. Belg.*).—The *Nepenthes* contain a zymase, which, in acid solution, has a peptonising action. As in the case of *Drosera*, contact with some object causes an abundant flow of an acid and an enzyme, and in both cases a glutinous material also exudes. After digestion, the ascidia contain a large quantity of liquid, which has frequently an amber colour. This colour is due to a substance which is turned red by alkalis; its origin is unknown; it is not a digestion product allied to tryptophan or a chromogen, for trypsin-like enzymes and amino-acids have not been found in the *Nepenthes*, but it is probably a dye derived from the tannins present in the glands. Experiments in glass vessels show that a peptonising zymase is present in the fluid from the ascidia, but digestion can only be induced at a temperature far higher than that which obtains in the ascidia. Since, too, in the plants themselves the albumin disappears very rapidly, the proteids may possibly be absorbed without previous digestion. *N. melamphora* is capable of digesting albumoses, although these substances are not directly diffusible. As the albumin decomposes it is quickly absorbed. When the ascidia are full of insects, putrefaction sets in, but the plant is not injuriously affected, since it can absorb nitrogen as ammonia or amino-acids. The proteid ammonia disappears, therefore, very quickly in the ascidium fluid, and during digestion the plant requires a supply of nitrogenous food, more particularly as it generally lives as a parasite, and is thus incapable of obtaining nitrogen in the usual way. The plants may possibly also absorb a portion of the mineral substances of the insects.

E. W. W.

Effect of Osmotic Pressure on the Form and Structure of Plants. By J. BEAUVERIE (*Compt. rend.*, 1901, 132, 226—229).—Water culture experiments are described in which *Phaseolus*, *Pisum*, *Lupinus*, *Zea*, and *Triticum* were grown in water alone, in Knop's solution, and in the same liquids with increasing amounts of sodium chloride up to 1.5 per cent. In water, the roots of the *Leguminosæ* bent at an angle of 90° when they came in contact with the liquid, and branched out above or just below the surface. Even with Knop's solution there was a tendency for the branch roots to grow upwards. Addition of sodium chloride to Knop's solution caused this irregularity to disappear; as the strength of the solution was increased, the roots went deeper, except in the case of wheat, whilst the aerial portions of the plants were stunted.

N. H. J. M.

Rôle of the Chlorophyllic Function in the Evolution of Terpenoid Compounds. By EUGÈNE CHARABOT (*Compt. rend.*, 1901, 132, 159—161. Compare *Abstr.*, 1900, i, 241, 303; ii, 101, 361, 362; this vol., i, 38; ii, 34).—Specimens of *Mentha piperita* having green leaves were found to yield an essence containing 9.8 per cent. of ethers, 9.8 per cent. of menthone, and 42.1 per cent. of total menthol; the oil from the red-leaved variety of this plant contained 4.7, 17.1, and 48.3 per cent. of ethers, menthone, and total menthol respectively. Lavender plants deprived of their inflorescences yield an oil containing 39.2 per cent. of ethers, whilst the essence from the complete plant contains only

36.2 per cent. Analyses of the essential oils of plants cultivated under dissimilar hygrometric conditions indicate that dry air favours the formation of ethers.

The transformation of the terpenoid alcohols of plants into their corresponding ethers and terpenes is due to the influence of the chlorophyllic function, and those changes in the environment which strengthen this function are consequently favourable to the genesis of the products of dehydration.

G. T. M.

Production of Proteids in Plants in Absence of Light. By M. IWANOFF (*Landw. Versuchs-Stat.*, 1901, 55, 78—94).—Roots of *Brassica napus* and *Daucus carota*, and potato tubers were kept in darkness for some weeks. The roots and tubers were analysed before and after the formation of leaves.

In two cases, there was a rather slight increase in proteids, but on the whole the results indicate that the formation of proteids goes on in darkness. Even if the increase in proteids as found is assumed to be due to error, the amount of proteids could only remain equal in the very improbable event of the growth having taken place without loss of proteids. A considerable amount of proteids was found in the leaves of *Brassica napus*, and this must have been newly formed proteid unless it had migrated from the roots in the form of albumin or peptone.

A considerable production of proteids can only take place in darkness when the object contains abundance of amides and considerable amounts of readily available carbohydrates, as is the case with bulbs of *Allium cepa* (compare Prianischnikoff, *Abstr.*, 1900, ii, 233).

N. H. J. M.

Reproduction of Proteids from the Products of their Decomposition. By ERNST SCHULZE (*Landw. Versuchs-Stat.*, 1901, 55, 33—44).—Replying to Prianischnikoff (*Abstr.*, 1900, ii, 233), the author states that he has obtained new evidence that asparagine can be produced from other products of the decomposition of proteids (*Ber. deut. bot. Ges.*, 1900, 18, 36).

From the results of experiments in which plants of *Phaseolus vulg.* were analysed after being kept for some days in 1 per cent. glycerol, Prianischnikoff concluded that the slightly increased percentage of proteid nitrogen did not indicate that there had been a regeneration of proteids. It is pointed out that only a small increase, or no increase at all, is no evidence that proteids have not been regenerated; an increase in proteids can only take place when the production in some parts of the plant is in excess of the loss in other parts. In absence of light, the production of proteids can only be considerable when all the other conditions are exceptionally favourable, when proteids are present only in small amount, and when amides and reducing sugar are abundant.

The author considers that Prianischnikoff's observations are in no way opposed to his own results, and only criticises his conclusions.

N. H. J. M.

The Manna of Olives. By TRABUT (*Compt. rend.*, 1901, 132, 225—226).—The olive trees of the village of Mansourah in the Pro-

vince of Bibans are subject to a disease of bacterial origin communicated by the inoculation of the cortex by certain insects, probably locusts. The bacteria develop in the cambium and provoke the complete decomposition of the cortex and the exudation of a sugary product resembling the manna of the ash. This substance, called by the natives "Assal zitoun," the manna of olives, contains 52 per cent. of mannitol, 7·8 per cent. of reducible sugar, and 21·5 per cent. of other organic matter, a portion of which is precipitable by alcohol. The wood which is laid bare by the decomposition of the cortex undergoes a very marked change and becomes veined and blackened.

G. T. M.

Presence of Sucrose in Panama Wood. By G. MEILLÈRE (*Bull. Soc. Chim.*, 1901, [iii], 25, 141—142).—The carbohydrate contained in the wood of *Quillaia smegmadernos*, hitherto considered the same as Meyer's lactosin, is now shown by its physical and chemical properties to be identical with sucrose.

N. L.

Chemical Composition of the Coffee of Grande Comore. By GABRIEL BERTRAND (*Compt. rend.*, 1901, 132, 162—164).—The berries from *Coffea Humblotiana* found on the island of Grande Comore differ from those of *C. Arabica* or *C. Liberia* in containing no caffeine; experiments made on 1 kilo. of the material failed to reveal any trace of this alkaloid. The difference is not due to the soil or the climate in which the plant is cultivated, for *C. Arabica* grown under precisely similar conditions still yields the normal amount of caffeine.

G. T. M.

Autumnal Return of Substance in Hops. By C. FRUWIRTH and W. ZIELSTORFF (*Landw. Versuchs-Stat.*, 1901, 55, 9—18).—The results of the authors' experiments indicate that a portion of the nitrogen, potash, and phosphoric acid of the leaves and stems of hops return to the roots in the autumn.

N. H. J. M.

Ivy as a Calcareous Plant. By W. VON KLENZE (*Chem. Centr.*, 1901, i, 225; from *Zeit. landw. Vers.-Wes. Oester.*, 3, 629—630).—The air-dried wood of ivy yielded 2·57 per cent. of ash containing 31·09 of lime and 4·52 per cent. of magnesia. Ivy is thus undoubtedly a calcareous plant. It is not suitable for fodder, and is almost free from parasites.

E. W. W.

Nitrogenous Constituents of the Seeds and Seedlings of *Lupinus Albus*. By NICOLAI J. WASSILIEFF (*Landw. Versuchs-Stat.*, 1901, 55, 45—77).—White lupin seeds contain more total and proteid nitrogen than blue, but less than yellow lupins (compare E. Schulze, *Landw. Jahrb.*, 1878, 7, and Merlis, *Abstr.*, 1898, ii, 133).

Seedlings of white lupins 7 days old contained in the cotyledons tyrosine, leucine, arginine, and histidine, whilst it is probable that phenylalanine, aminovaleric acid, and leucine are present in the axils.

The leaves of seedlings 2 weeks old did not contain much amino-acid; leucine and perhaps aminovaleric acid were found, but not tyrosine. The leaves also contained asparagine and vernine and, probably, xanthine.

The following numbers show the amounts of nitrogen (per cent. of total N) in different forms in the seeds and seedlings (7 and 14 days old) of *Lupinus albus*.

Nitrogen in	Seeds.	Seedlings.	
		7 days.	14 days.
Proteids	89.69	42.47	43.47
Phosphotungstic acid precipitate.	6.90	10.56	7.63
Asparagine	—	32.15	39.79
Other amides	3.41	14.82	9.11

From these results, it might be supposed that vegetation in presence of light and the production of carbohydrates have only a slight effect on the reproduction of proteids from amides. The decomposition of the reserve proteids was, however, not completed in 7 days; moreover, the plants acquired considerable amounts of nitrogen from outside and contained a good deal of nitrogenous matter for the production of proteids, much of which material remained after 14 days.

The fact that at the end of the second week much of the nitrogen was in the form of asparagine accords with E. Schulze's assumption that asparagine is produced from other products of the decomposition of proteids. This explains how it is that the asparagine does not decrease in quantity notwithstanding its utilisation for proteid formation. Whilst the leaves contained 22.66 per cent. of proteids and 6.75 per cent. of asparagine, the stems contained 9.56 per cent. of proteids and 21.12 per cent. of asparagine.

N. H. J. M.

Production of Brewing Barley with Low Percentage of Nitrogen on Light Soils. By THEODOR RÉMY (*Bied. Centr.*, 1900, 27, 809—811; from *Bl. Gersten-, Hopfen-, u. Kartoffelbau*, 1900, 51).—When, as in Brandenburg, sandy soils are periodically liable to suffer from insufficiency of water, the whole of the assimilable nitrogen, intended for large crops, is available; the result is a crop rich in nitrogen. In such cases, the seed should be sown early and the soil should be deeply worked before the winter and harrowed in the spring. The most suitable amount of nitrogen for a particular soil and climate can only be determined experimentally. As regards the form of nitrogen to be applied, nitrate will give satisfactory results if the climate and other conditions are favourable during the later stages of growth, but not otherwise. Ammonium salts, and especially organic nitrogen, are safer manures, as they act more slowly and do not promote the early growth to the same extent as nitrate.

To obtain barley poor in nitrogen, the yield must be increased as much as possible without increased application of nitrogen; the land must be well prepared and suitable plants selected.

N. H. J. M.

Composition of Grasses from Different Meadows. By ADOLPH EMMERLING, C. WEBER, FR. BACHÉ, and H. HILBERT (*Bied. Centr.*, 1900, 29, 804—807. Compare *ibid.*, 1894, 23, 517).—It was previously shown that the chemical composition of good varieties of grass is not essentially different from that of inferior varieties, and that Wittmack's botanical method of analysis is uncertain for valuing hay, but is of greater importance in the case of pasture.

In the experiments now described, the grasses were grown together on three different soils. The results showed that there is no relation between the amounts of nutritive matter and the variety of the grass, or between the average composition of the superior grasses and that of the inferior grasses, which could be utilised in valuing the grasses according to the botanical composition. The value of hay can therefore only be ascertained by chemical analysis.

N. H. J. M.

Effect of Different Amounts of Inoculating Material on the Production of Nodules and the Yield of Leguminosæ. By FRIEDRICH NOBBE and LORENZ HILTNER (*Landw. Versuchs-Stat.*, 1901, 55, 141—148).—The results of nitrogen experiments with peas and *Vicia villosa* showed that the amount of inoculating material has no influence within the limits of 1:10,000. Nitragin may be diluted a hundred times without any diminution in effect. Owing, however, to the various losses to which bacteria are exposed in the soil, it would not be advisable in practice to employ the amount of nitragin hitherto applied to $\frac{1}{4}$ hectare for larger areas.

N. H. J. M.

Utilisation of Gorse. By ANTOINE CHARLES GIRARD (*Ann. Agron.*, 1901, 27, 5—44).—Attention is called to the importance of gorse for feeding, and as litter and green manure. Gorse grows on soils poor in mineral matter, and obtains its large amount of nitrogen by fixation. It is estimated that a crop of 20,000 kilos. may be obtained per hectare, and that this is equivalent to 8000 kilos. of hay.

The average composition of the samples of gorse analysed is as follows: Water, 52.67; nitrogenous matter, 4.55; fat, 0.90; non-nitrogenous extract, 25.99; cellulose, 14.32, and ash, 1.57 per cent. The amounts of sugars, pentosans, and pectic substances are: 1—1.8; 8—10, and 1.1—2.2 per cent. respectively. The ash contains K_2O , 27.13; CaO , 11.71; MgO , 4.28; Fe , 1.66; P_2O_5 , 6.71, and SO_3 , 4.68 per cent.

The results of feeding experiments with a horse show that the following percentage amounts of the different constituents were digested: Ash, 40.4; fat, 21.6; nitrogenous matter, 56.0; crude cellulose, 42.8; sugars, 100; saccharifiable substances, 54.7; total non-nitrogenous extract, 54.6. Less satisfactory results were obtained with a sheep.

N. H. J. M.

Influence of Feeding on [the Composition of] Butter. By H. WEIGMANN and OTTO HENZOLD (*Chem. Centr.*, 1901, i, 132—133; from *Milch-Zeit.*, 29, 737—738, 756—758).—The change from pasture to stall feeding resulted in a slight decrease in the volatile fatty acids (about 19—17.5); a further change, in which wheat bran was substituted for a portion of the mixed hay food, caused a great depression (to 13.83), which, however, only lasted for 2 days; this depression was followed by a permanent increase (20—22). The great decrease in volatile fatty acids is attributed to the change rather than to the nature of the food.

Further experiments showed that a change of food only affects the amount of volatile fatty acids when the foods are very dissimilar. Straw, linseed, and poppy-seed cakes are unfavourable to the produc-

tion of volatile fatty acids. At the beginning of the period of lactation, crushed rye, wheat bran, cotton seed cake, and green fodder increase the amounts of volatile fatty acids. N. H. J. M.

Changes in the Fat During the Ripening of Cheese. By KARL WINDISCH (*Chem. Centr.*, 1901, i, 128—130; from *Arbb. K. Ges.-A.*, 17, 1—160).—During the ripening of cheese, large amounts of free acids are produced by the decomposition of the fat. At the same time, the Reichert-Miessl and refractometer numbers are gradually reduced as are also, to a less extent, the saponification numbers. The acids are mainly non-volatile higher acids, volatile fatty acids being formed only in relatively small amounts. The decrease of volatile fatty acids during ripening and storing is of importance in distinguishing genuine from margarine cheeses. A margarine-Edam cheese did not produce an appreciable amount of volatile fatty acids in three years, whilst in margarine-Romadur cheese there was a slight production of volatile acids in ten months.

The changes which cheese undergoes are similar to the changes in butter which becomes rancid, although the changes in cheese are much greater. In rancid butter and lard, however, the iodine number decreases, whilst during the ripening of cheese it first gradually decreases and then increases.

The glycerol liberated during the ripening of cheese gradually disappears, being probably destroyed by microbes.

The chief cause of the decomposition of cheese fat is the action of microbes, some of which probably produce enzymes; these break up the glycerides, and in this way produce food suitable for the microbes. The decomposition of the glycerides is also partly due to the action of ammonia which is produced, along with soluble proteids and amides, by the action of microbes on paracasein.

Henzold's process for separating cheese fat (*Abstr.*, 1896, ii, 680), was found to be unsuitable. The hydrochloric acid process (*Arbb. K. Ges.-A.*, 14, 554, and *Chem. Centr.*, 1898, ii, 932), in which all the fatty acids, including those in combination with ammonia, are obtained, was employed. N. H. J. M.

Examination of the Bog Earth of Bad-Sülze, and Göldenitz, with a Comparative Table of Certain Bog Earths. By PAUL HOFFMANN (*Zeit. anal. Chem.*, 1901, 40, 22—33. Compare *Abstr.*, 1899, 798, 799).—The examination of the soil of these two bogs was undertaken to ascertain their suitability for the preparation of medicinal baths, for which purpose the presence of ferrous sulphate and sulphuric acid in an aqueous extract is generally considered requisite. From the very small amount of these substances in some bog earths of notable therapeutic value, the author is, however, inclined to doubt whether the beneficial action is entirely to be attributed to them. Two samples of the Sülze bog earth were analysed, both in the fresh condition and after 6 months' weathering. Only in one of the weathered samples was a trace (0.12 per cent.) of iron soluble in water found. Since the dry earth contained 6.99 and 4.63 per cent. of iron, chiefly in the form of disulphide, it is probable that with

longer weathering some of it would become soluble. The dry, un-weathered samples contained in 100 parts:

Soluble in water.				Soluble in acid (HCl).				
Mineral substance.	Organic substance.	SO ₃ .	CaO.	Mineral substance.	SO ₃ .	P ₂ O ₅ .	CaO.	Fe ₂ O ₃ .
1. 8.17	1.12	0.69	0.16	20.44	1.09	0.18	4.47	0.68
2. 2.38	0.44	0.35	0.14	6.48	0.38	0.10	0.03	0.97
Total sulphur.		Humic acid.		Humin.		Cellulose.		
1.	9.93	3.62		10.41		7.1		
2.	6.42	7.98		3.28		7.34		

A small quantity of free sulphur was present; nitrites were found, also formic and tannic acids, but no acetic acid.

The dry substance of the Göldenitz earth is almost wholly (97.3 per cent.) organic, with only 0.146 per cent. of iron. It is therefore of use solely as a cheap fuel.

M. J. S.

Employment of Pepsin Solution for Investigating Fæces and Stable Manure. By THEODOR PFEIFFER and OSCAR LEMMERMANN (*Landw. Versuchs-Stat.*, 1900, 55, 129—140. Compare Abstr., 1886, 1053, and Kühn, *ibid.*, 1894, ii, 389).—The authors consider that Pfeiffer's method is preferable to that proposed by Bülow (Abstr., 1900, ii, 459), but that Bülow's results, indicating that the substance may be dried at 55—60°, are of great importance. The following method has recently been employed by the authors.

The finely cut and well mixed manure (100 grams) is digested for 48 hours at 38—40° with 500 c.c. of Wedemeyer's pepsin solution and hydrochloric acid (Abstr., 1899, ii, 460). The solution is neutralised as exactly as possible, evaporated to dryness, weighed, and finely ground; 5 grams are used for estimating the indigestible nitrogen in the usual manner.

The opinion has been expressed (this vol., ii, 37) that the varying effect of stable manure is due to different degrees of decomposition. Samples of fresh manure containing the same amount of dry matter (35.8 grams) were made equally moist by adding water and 20 c.c. of soil extract, and kept for three months at 38°. The samples were then examined by the method just described, when it was found that the "digestibility" had not, as was expected, increased, but diminished in different degrees. Pot experiments were made with fresh manure and with manure which had been kept; the results showed a good deal of similarity with those of the digestive experiments, and although there were divergences which cannot be explained, the new method is considered promising.

N. H. J. M.

Analytical Chemistry.

Arrangements for Electrolytic Analysis. By HUGH MARSHALL (*J. Soc. Chem. Ind.*, 1900, 19, 992—994).—A convenient and compact apparatus and equipment of the usual type for electrolytic analysis, which cannot be well understood without the accompanying illustrations.

L. DE K.

The Electrolysis of Copper Sulphate as a Basis for Acidimetry. By CHARLES A. KOHN (*J. Soc. Chem. Ind.*, 1900, 19, 962—963).—The author prepares a sulphuric acid the actual strength of which is accurately known by submitting a solution of twice recrystallised copper sulphate to the usual electrolysis. The metal is weighed and the corresponding acid calculated. By means of the dilute acid so obtained, the strength of alkaline solutions may be accurately determined.

L. DE K.

The Preparation of an Exact Standard Acid. By C. LONGUET HIGGINS (*J. Soc. Chem. Ind.*, 1900, 19, 958—962).—The processes which have been proposed from time to time for the preparation of an exact standard acid are reviewed, and the conclusions drawn that the only really trustworthy method is that based on the absorption of hydrogen chloride by water as proposed by Moody (*Trans.*, 1898, 73, 658).

The author had independently conceived the same idea, his apparatus being, however, somewhat different. Hydrochloric acid is allowed to run from a separating funnel into strong sulphuric acid contained in a generating flask, the gas evolved passes first through two wash-bottles containing sulphuric acid and then into a specially constructed absorption bulb, fitted with a capillary delivery tube provided with a two-way tap, and containing a known weight of water. When sufficient gas is supposed to have been absorbed, the bulb is disconnected and reweighed. An acid of known composition is thus obtained.

L. DE K.

Ferrisalicyclic Acid as an Acidimetric Indicator. By J. E. GEROCK (*Chem. Centr.*, 1900, ii, 1294; from *Ann. Chim. anal. appl.*, 5, 421).—Ferrisalicyclic acid is a very serviceable indicator in some special cases, but cannot replace the ordinary indicators for general purposes.

M. J. S.

Separation and Identification of Acids. By RICHARD ABEGG and W. HERTZ (*Zeit. anorg. Chem.*, 1900, 25, 405—406).—In reply to Fresenius (*Abstr.*, 1900, ii, 754), the authors agree that hydrocyanic and arsenious acids are not precipitated by calcium chloride. The first would be precipitated in the zinc group along with ferrocyanide and ferricyanide; in presence of these, it is recognisable by the smell of hydrocyanic acid, produced by warming with dilute sulphuric acid. The second must be tested for by hydrogen sulphide. The complete precipitation of tartaric acid by calcium chloride is not necessary, since

the small quantity remaining in solution does not interfere with subsequent tests. Boric acid is recognised by the green alcohol flame in the portion of the calcium precipitate which is soluble in acetic acid.

T. E.

Detection of Chlorates and Bromates by the Use of Strychnine. By FAGES (*Chem. Centr.*, 1901, i, 202—203; from *Ann. Chim. anal. appl.* 1900, 5, 441).—Chlorates and bromates produce a red coloration in a solution of strychnine nitrate. 0.81 gram of strychnine is dissolved in 24 c.c. of nitric acid of sp. gr. 1.334 and 1—2 drops of the chlorate solution are added to 1 c.c. of the reagent. The reagent must always be present in excess. With traces of chlorate, the coloration requires 16—20 minutes to develop. Hypochlorites, chlorine, bromine, hydrochloric acid, nitrites, chlorides (if in large excess), and especially ferric chloride, hinder the reaction; iodates and perchlorates neither produce nor prevent the reaction. The red substance is not removed by carbon disulphide, ether, chloroform, or benzene. The reagent will not keep for 24 hours. M. J. S.

Estimation of Fluorine in Zinc Blendes. By FRIEDRICH BULLNHEIMER (*Zeit. angew. Chem.*, 1901, 101—104).—Satisfactory results were not obtained when using Bein's process (heating with sulphuric acid and quartz powder, passing the vapours into water, and collecting the precipitated silica), as only about one-third of the fluorine present was found. Good results were, however, obtained by means of a modification of the process devised by Fresenius.

The apparatus consists of an Erlenmeyer flask of 300—400 c.c. capacity provided with a trebly-perforated indiarubber cork. Through one of the holes passes a thermometer, through the others, the inlet and exit tubes. The latter is connected with a U-tube filled with glass-wool which is in turn connected with a Winkler worm tube, which may be surrounded by cold water, and is fitted to the absorption apparatus, consisting of a Dreschmidt wash-bottle containing 80 c.c. of solution of potassium chloride. For passing a current of air, Fresenius's directions should be followed.

If the apparatus is found to be air-tight, 2.5 grams of the finely powdered sample intimately mixed with 3—5 grams of powdered quartz are put into the flask, 20 grams of chromic acid dissolved in 100 c.c. of strong sulphuric acid are added and the cork is at once inserted. Purified air is now passed through the apparatus, and the flask is slowly heated on an iron or aluminium plate to about 80°; when action sets in, great heat is developed, and the source of heat may be temporarily removed; afterwards the temperature may be raised to 150—160°. After heating for three hours, all the silicon fluoride is expelled and absorbed in the wash-bottle. To the contents of this is now added an equal volume of alcohol, and after some time the liquid is rapidly titrated with *N*/10 sodium hydroxide, using phenolphthalein as indicator. One c.c. of *N*/10 alkali corresponds with 0.005685 gram of fluorine. L. DE K.

Detection of Added Sulphuric Acid in Wine. By F. CARPENTIERI (*Chem. Centr.*, 1900, ii, 1216; from *Staz. sperim. agrar. ital.*, 33, 307—340).—The new process is based on the determination of the

relation between ash and sulphuric acid. Pure wines investigated by the author showed the following relation. When the wine contains from 0.0—1 per thousand of sulphates (? potassium sulphate) the relation is as 8.3 : 2.93, for 1.1—2 as 3.29 : 2.00, for 2.1—3 as 2.23 : 1.55, and for more than 3 as 1.42 : 1.18.

The proportion is diminished if the wine has been mixed with sulphuric acid either during or after the fermentation. If the wine has been neutralised previously to adding the acid, the test becomes useless. If the neutralisation has been effected by potash, the comparative soluble and insoluble alkalinity may give a clue. L. DE K.

Amount of Selenium in Sulphuric Acid. By N. A. ORLOFF (*Chem. Zeit.*, 1901, 25, 66).—The author does not approve of the codeine test for selenium as proposed by Schlagdenhauffen and Pagel (*Abstr.*, 1900, ii, 342), but has obtained satisfactory results by applying the sulphurous acid test.

Five parts of the sample of sulphuric acid to be tested are mixed with 10 parts of water and 10 parts of solution of sulphurous acid; the selenium is then precipitated slowly in the cold, and more rapidly on warming, and may be collected and weighed. The author did not meet with any selenium in the pure German or Russian acid, but a Russian crude acid contained 0.024 per cent. of selenium. Acid of French origin was not at the author's disposal. The sulphurous acid test serves to detect as little as 0.003 per cent.; for still smaller quantities, the codeine test is quite untrustworthy. L. DE K.

Detection of Ammonia by Mercuric Chloride. By ANNIBALE FERRARO (*Chem. Centr.*, 1901, i, 203; from *Boll. Chim. Farm.*, 1900, 39, 797).—The precipitate produced by mercuric chloride in natural waters free from ammonia is readily soluble in a small excess of cold acetic acid, but if ammonia is present the precipitate dissolves only very slowly and requires much acid. Nessler's reagent should, however, be employed as a confirmatory test. M. J. S.

Analysis of Nitric and Mixed Acids by Du Pont's Modification of Lunge's Nitrometer. By J. R. PITMAN (*J. Soc. Chem. Ind.*, 1900, 19, 982—984).—The author prefers using the apparatus devised by Du Pont instead of the Lunge nitrometer, as it is possible to make a duplicate analysis of nitric acid or a mixed acid within half an hour. As the quantity operated on may be five or six times as large as when using Lunge's nitrometer, the results are consequently more accurate.

The apparatus should be standardised by means of pure potassium nitrate and a particular specimen of sulphuric acid, the same volume of which is used in the testing of the samples. No readings of temperature or pressure are then required. L. DE K.

Estimation of Phosphoric Acid in Basic Slags. By A. N. PAPEŽ (*Chem. Centr.*, 1900, ii, 1213—1214; from *Zeit. landw. Vers. Wes. Oest.*, 3, 695—713).—The author states that the conventional methods for the estimation of the citrate solubility, the citric acid solubility, the solubility in 5 per cent. formic acid, and the total phosphoric acid all give satisfactory results. As regards the Austrian nitric acid

method for estimating the phosphoric acid, the author recommends boiling the slag with nitric acid of sp. gr. 1.25. L. DE K.

Detection of Mineral Phosphates in Basic Slags. By NORBERT VON LORENZ (*Chem. Centr.*, 1900, ii, 1213; from *Zeit. Landw. Vers. Wes. Oest.*, 3, 684—686).—Mineral phosphates almost invariably contain fluorides, therefore when fluorine is present in a basic slag, an admixture of mineral phosphate is probable. The method formerly recommended by the author (*Abstr.*, 1888, 1340) is not suitable for basic slag on account of its being interfered with by the presence of sulphides. To detect fluorine in basic slags, the convex side of the watch glass is covered with a piece of filter-paper moistened with 5 per cent. aqueous soda, the paper is then washed with a little water and the liquid is tested for fluorine by adding acetic acid and calcium acetate. A turbidity or precipitate either before or after boiling shows the presence of fluorine. Superphosphates, bone meal, and animal charcoal may be similarly tested for mineral phosphates. L. DE K.

Chemical Examination of Soil. By GEORG BERJU (*Landw. Versuchs-Stat.*, 1901, 55, 19—31).—In extracting soils with 1 per cent. citric acid solution, agitation for 6 hours one day and for 2 hours the next day in a Wagner's rotatory apparatus is sufficient as regards calcium and potassium, and, in the case of most soils, for phosphoric acid also. Continued agitation for 8 hours does not have the same effect.

In the case of humous loamy soil, the above treatment seems to be insufficient, and the soils should be agitated with the solvent for at least 7 days, unless it is considered that the phosphoric acid dissolved by the more prolonged treatment is less assimilable.

The fact that the potassium of sandy loams and loams is sparingly soluble in 1 per cent. citric acid is perhaps due to the absorptive power of these soils for assimilable potash. The result of experiments by Knop's method showed that the absorptive power for ammonia and potash is very slightly reduced by 1 per cent. citric acid. The relation of the solvent to the soil was, however, only 2 : 1 in these experiments, whilst in extracting the soils 10 parts of citric acid solution were used with 1 part of soil. N. H. J. M.

Arsenic Mould (*Penicillium Breviceale*). By B. GOSTO (*L'Orosi*, 1900, 23, 361—377).—This organism is capable of killing by ingestion, as was shown in the case of some rabbits kept in a chamber in which the mould was being grown.

The use of *Penicillium breviceale* for detecting the presence of arsenic has been applied to natural waters, the intestines in cases of suspected poisoning, coloured materials, chemical products, physiological secretions and minerals, in all cases with satisfactory results.

The gas evolved by this organism in the presence of an arsenic compound (shown by Biginelli to be diethylarsine, this vol., i, 20) may be detected otherwise than by its odour, by passing it into a solution of 8 to 12 parts of mercuric chloride and 20 parts of hydrochloric acid in 80 parts of water, when a crystalline mass is gradually formed at the point where the gas bubbles through the liquid. T. H. P.

Biological Test for Arsenic. By BRUNA GALLI-VALERIO and CASIMIR STRYZOWSKI (*Chem. Centr.*, 1901, i, 63; from *Pharm. Post.*, 33, 637—639, 649—651. Compare Abstr., 1900, ii, 299).—By the action of *Penicillium brevicaulis* on a millionth of a gram of arsenious oxide, mixed with about 5 grams of bread crumbs, the characteristic arsenical odour was developed in 3 days, and in 2 days more it still remained distinctly perceptible, but had become less marked. In the case of a patient who had taken 44 milligrams of arsenic in 8 days, arsenic could be detected by this test in the tears, mucous membrane of the nose, saliva, and in the ash of the urine and faeces, but not directly in the hair, nails, perspiration, or urine. The composition of the gas liberated by the mould is unknown, but it probably consists of arsines. Small quantities of arsenic are completely volatilised, and the residue is absolutely free from arsenic. E. W. W.

Separation of Arsenic. By MARTIN ROHMER (*Ber.*, 1901, 34, 33—38).—On distilling a solution containing an arsenate to which a small quantity of hydrobromic acid has been added in a stream of hydrogen chloride and sulphur dioxide, the whole of the arsenic is volatilised as chloride, and after absorption in water, the arsenious acid can be estimated either volumetrically, by means of standard iodine, or gravimetrically, by precipitation as arsenious sulphide; the addition of hydrobromic acid accelerates the reduction of the arsenic acid, which otherwise takes place very slowly. If 170 c.c. of solution is distilled until its volume is 40 c.c., a single distillation, occupying about 45 minutes, usually suffices to separate 0.15 gram of arsenic. The sulphur dioxide in the distillate is removed by diluting and boiling for 20 minutes in a reflux apparatus, a stream of carbon dioxide being continually passed through the solution.

If antimony is present, it remains in the distilling flask, and can be estimated by precipitation as sulphide, after boiling to remove sulphur dioxide; the antimony sulphide thus obtained contains varying amounts of sulphur, which cannot be removed by carbon disulphide, but is eliminated by heating for 2 hours at 225—230° in an atmosphere of carbon dioxide. If tin is present as well as antimony, the latter has to be estimated volumetrically. The author is still investigating this case.

Analyses are given showing the degree of accuracy of the method, which indicate that the presence of other metals is not deleterious.

W. A. D.

Analysis of Italian Crude Boric Acid. By E. ZSCHIMMER (*Chem. Zeit.*, 1900, 25, 44—45, 67—68).—The author, as the result of many experiments, has come to the conclusion that for the assay of crude boric acid the titration process is the best and the following scheme is recommended. 1. One gram of the air-dried sample is dissolved in 300 c.c. of pure glycerol with addition of water, and titrated with standard barium hydroxide, with phenolphthalein as indicator; when a pink coloration is produced, more glycerol is added, and should the colour disappear, the titration is continued. 2. One gram of the sample is dissolved in water and in the filtrate any sulphuric acid is estimated. 3. A few mixtures of boric acid and ammonium sulphate of known composition are made and titrated as

before, so as to know once for all how many c.c. of barium hydroxide solution correspond with 1 gram of sulphur trioxide present as ammonium sulphate. 4. A blank experiment should be made to determine any accidental acidity in the glycerol. 5. From the number of c.c. of barium hydroxide solution used for 1 gram of the sample are deducted the number of c.c. corresponding with the sulphur trioxide and those required by the glycerol. The balance is then calculated to boric acid. Very concordant results were obtained.

L. DE K.

Adulteration of Roasted Coffee by means of Addition of Water and Borax. By E. BERTARELLI (*Zeit. Nahr.-Genussm.*, 1900, 10, 681—683).—The author calls attention to the fact that some dealers soak the roasted coffee berries in a boiling 5 per cent. solution of borax; the berries then reabsorb the greater part of the moisture lost during the roasting.

The amount of borax introduced is, however, not large enough to perceptibly increase the ash. If, therefore, a sample of roasted coffee berries shows an excess of moisture, borax may be suspected and should be tested for in the usual way.

L. DE K.

Behaviour of Borax on Distillation with Methyl Alcohol. By EDUARD POLENSKE (*Chem. Centr.*, 1901, i, 15; from *Arbb. Kais. Ges.-A.*, 17, 564—568).—When borax is distilled with methyl alcohol, 57—59 per cent. of the boric acid passes into the distillate, of which the first portions contain by far the greatest part. By adding ether to the residue, sodium metaborate, $\text{NaBO}_3 \cdot 5\text{MeOH}$, is obtained. The borax is not directly decomposed into boric acid and sodium oxide by distilling with the alcohol, but first forms sodium metaborate and boric acid. The metaborate is then attacked, and the decomposition continues until the composition of the residue corresponds with $\text{Na}_{10}\text{B}_3\text{O}_{17}$. This residue is not homogeneous, but probably contains sodium metaborate and sodium oxide, the excess of the latter preventing further decomposition. Hönig and Spitz's volumetric method is thus correctly based on the existence of sodium metaborate. When C. Fresenius and Popp's method is used for the examination of sausage which contains borax alone, the complete volatilisation of the boric acid is due to the decomposition of the borax in the original material; in this case, the sausage has a faintly acid reaction.

E. W. W.

Apparatus for the Auto-regulation of Combustion in Organic Analysis. By E. A. GANIKE (*J. Russ. Phys. Chem. Soc.*, 1900, 32, 819—825).—A description, with figures, is given of an electrical contrivance, by means of which the height of the flame of the two burners directly under the boat containing the substance to be burnt, in a combustion tube is regulated according to the rate at which the products of combustion bubble through the potash bulbs.

T. H. P.

Estimation of Potassium by Perchloric Acid in Commercial Analyses. By CARLO MONTANARI (*Chem. Centr.*, 1901, i, 203—204; from *Staz. sperim. agrar. ital.*, 1900, 33, 454).—A solution of perchloric acid is prepared by shaking 100 grams of sodium perchlorate

with 150 grams of pure concentrated hydrochloric acid, filtering through glass wool, and expelling the hydrochloric acid from the filtrate by evaporation. Half a gram of substance, freed from ammonia and sulphates, is dissolved in 15—20 c.c. of water and mixed while warm with 1 c.c. of the reagent. The mixture is evaporated until volatile acids are expelled, and after cooling is stirred with 20 c.c. of 95 per cent. alcohol to which 2 vols. per cent. of perchloric acid solution are added. After some hours, the precipitate is collected on a Gooch filter, washed with 60—70 c.c. of the same acid-alcohol and then once or twice with alcohol alone. After drying at 120—130°, the precipitate is weighed, removed from the filter with hot water, and the tare taken. Owing to a slight solubility of the precipitate, the results are about 0.258 per cent. (of K_2O) lower than those obtained with platinic chloride, and this correction may be applied. M. J. S.

Estimation of Potash in Soil. By A. RÜMLER (*Landw. Versuchs-Stat.*, 1901, 55, 149).—The soil is extracted on a filter with definite amounts of lime water or a solution of potassium [? calcium] chloride. It is supposed that the potassium liberated by these solvents is that available for plants. Pot experiments are being made to ascertain whether this is the case. N. H. J. M.

Estimation of Lead in Galena. By M. WILLENZ (*Chem. Centr.*, 1900, ii, 1292; from *Ann. Chim. anal. appl.*, 5, 401).—The presence of calcium does not prevent the estimation of lead as sulphate, if the following process is adopted. One gram of the ore is dissolved in nitric acid, the solution evaporated with 5 to 6 c.c. of concentrated sulphuric acid, then treated with 50 c.c. of water and heated for 15—20 minutes on the water-bath, cooled, decanted through a filter, and the precipitate washed once with a 1 per cent. sulphuric acid and thrice with cold water. It is then dissolved in 25 c.c. of a feebly ammoniacal 33 per cent. solution of ammonium acetate, the solution filtered, washed with a 5 per cent. solution of ammonium acetate, and the lead precipitated by adding 5—6 c.c. of sulphuric acid. If some calcium sulphate should also be thrown down at this stage, the liquid is decanted, 1 to 2 c.c. of sulphuric acid and 250 c.c. of water are added to the precipitate, and the whole heated in the water-bath for an hour with frequent stirring. The lead sulphate is then treated in the usual way. In presence of antimony, some tartrate is added when dissolving. Copper is thrown down from the first filtrate by sodium thiosulphate, at the boiling temperature, after adding 10 c.c. more of sulphuric acid. M. J. S.

Volumetric Estimation of Thallium. By HUGH MARSHALL (*J. Soc. Chem. Ind.*, 1900, 19, 994—995).—About 0.2 gram of the thallos compound is dissolved in water, a crystal of potassium bromide is added, and then 25 c.c. of a standard solution of sodium bromate containing 2.467 grams of the salt per litre. After quickly adding a sufficiency of dilute hydrochloric acid, the mixture is distilled, and the liberated bromine estimated as usual. The loss in bromine represents the thallium. The author titrates the bromine

in the presence of potassium iodide with a solution of 5 grams of sodium thiosulphate in a litre of water; 1 c.c. of this represents 0.002 gram of thallium. The solution does not keep well, and should therefore be checked against 25 c.c. of the bromate solution.

The apparatus consists of a glass-stoppered, round-bottomed flask, with a side tube connected with a vertically placed spiral condensing tube, surrounded by a glass condenser, which dips into a bottle-shaped receiver containing a solution of potassium iodide. The hollow stopper of this bottle carries a side exit tube containing glass beads, also moistened with solution of potassium iodide, so as to ensure complete absorption of the bromine. L. DE K.

Analysis of Commercial Copper. By P. TRUCHOT (*Chem. Centr.*, 1901, i, 204—205; from *Ann. Chim. anal. appl.*, 1900, 5, 444).—Five to ten grams of the copper are dissolved in 25—50 c.c. of nitric acid, with addition, finally, of bromine or hydrogen peroxide. The filtered solution is electrolysed with a current of 0.8—1.2 volts, and after 15—18 hours the precipitated lead is collected, dissolved in hydrochloric acid and evaporated with sulphuric acid, taken up with water, the precipitate collected on the same filter, washed well with weak sulphuric acid, dissolved in ammonium acetate, and the filtrate electrolysed after adding nitric acid, when pure lead is obtained. For estimating the cobalt, nickel, and manganese, the first filtrate is evaporated with sulphuric acid; arsenic, antimony, and tin are removed by hydrogen sulphide, iron by precipitation, twice repeated, with ammonium carbonate, manganese thrown down as phosphate from a strongly ammoniacal solution, and nickel and cobalt precipitated by electrolysis. M. J. S.

Estimation of Copper in Pyrites. By OLE N. HEIDENREICH (*Zeit. anal. Chem.*, 1901, 40, 15—17).—In solutions containing much iron, copper cannot be directly estimated by electrolytic precipitation. A preliminary precipitation with aluminium is much more convenient than the use of zinc or hydrogen sulphide. The solution must be evaporated with hydrochloric acid until free from nitric acid. It is then acidified with hydrochloric acid and treated with aluminium foil at a gentle heat. The washed mixture of precipitated copper and excess of aluminium is then dissolved in dilute nitric acid, and the solution electrolysed in the usual manner, after addition of a little sulphuric acid. Small amounts of cobalt, nickel, zinc, and lead are without influence on the results. M. J. S.

Separation of Metals by means of Acetylene. By HENRIK G. SÖDERBAUM (*Bihang Svenska Vetensk.-Akad. Handl.*, 1900, 25, ii, No. 5, pp. 1—25. Compare *Abstr.*, 1897, ii, 348, and 1898, ii, 191).—The use of acetylene for the estimation of copper in mixtures of its salts with those of other metals has been extended to the following separations.

Copper from zinc.—The conditions given for the separation of copper from cadmium (*loc. cit.*) yield good results, the zinc being determined in the filtrate either as oxide or sulphide, or volumetrically by means of potassium ferrocyanide solution.

Copper from nickel.—In this case, the copper acetylide must be

washed, first with cold or tepid water, and afterwards, when the greater part of the ammonia has been removed from the precipitate, with boiling water; if the filtrate is turbid, or the filter paper coloured reddish-brown in places, the washing has been improperly carried out.

Copper from cobalt.—The same precautions as regards washing must be taken as with nickel; the cobalt is determined electrolytically as metal.

Each of the above separations has been tested for a number of different ratios between the quantities of the two metals present in the mixtures, the results being very satisfactory. T. H. P.

Detection of Alum in Wines. By FRANCESCO LOPRESTI (*Chem. Centr.*, 1900, ii, 1216; from *Staz. sperim. agrar. ital.*, 33, 373—377).—Fifty c.c. of the sample are evaporated to about one-third, and decolorised with animal charcoal. The filtrate is carefully neutralised with sodium or potassium hydroxide, and diluted to 50 c.c. A few drops of freshly prepared tincture of logwood are added, which cause a violet or blue coloration if alum is present; in its absence, the liquid is merely orange-yellow. L. DE K.

Solubility of some Metallic Oxides in Sodium and Ammonium Salicylate. By JULES WOLFF (*Chem. Centr.*, 1901, i, 207; from *Ann. Chim. anal. appl.*, 1900, 5, 445).—Cupric hydroxide dissolves in cold concentrated solution of salicylic acid, and with excess of sodium hydroxide a blue solution resembling Fehling's solution is produced. The copper sodium salicylate, $(\text{ONa} \cdot \text{C}_6\text{H}_4 \cdot \text{CO}_2)_2\text{Cu}$ can be obtained in moss-green crystals containing water of crystallisation which they lose in dry air.

Ferric and aluminium hydroxides are also soluble in ammonium salicylate, and from this solution hydrogen sulphide precipitates the iron completely, leaving aluminium in solution. By evaporating the filtrate and heating at 200° , pure alumina is left. M. J. S.

Proximate Analysis of Clays. By W. JACKSON and E. M. RICH (*J. Soc. Chem. Ind.*, 1900, 19, 1087—1088).—It is shown that the conventional proximate analysis of clays, by means of hot sulphuric acid gives altogether untrustworthy results, particularly in the case of plastic clays, as any felspar present is largely attacked by both the acid and the subsequent alkaline treatment. L. DE K.

Testing of Weldon-deposit. By KONRAD W. JURISCH (*Zeit. angew. Chem.*, 1901, 3). Reply by GEORG LUNGE (*ibid.*, 60).—Jurisch states that Hurter originated the process of testing Weldon-deposit by means of a normal solution of oxalic acid.

In reply, Lunge states that Weldon deserves the credit of having worked out the process. L. DE K.

Estimation of Manganese and Chromium in Tungsten Alloys. By FRED IBBOTSON and HARRY BREARLEY (*Chem. News*, 1900, 82, 209—210).—Manganese is estimated in tungsten powder and alloys by treating 1 gram with 10 c.c. of hydrofluoric acid and 4 c.c. of nitric acid, adding, when action slackens, 2 or 3 c.c. of sulphuric acid, then oxidising, and titrating in the usual way. As a rule,

these alloys and powders contain less than half a per cent. of manganese; in the case of alloys, sometimes met with, containing 10 per cent. of manganese, not more than 0.1 gram should be used.

In the estimation of chromium in alloys of iron, chromium, tungsten, and manganese, the alloy is digested with a mixture of sulphuric and hydrofluoric acids, treated with a few grams of solid permanganate, then diluted and boiled with excess of permanganate until solution is complete. Or it may be dissolved in nitro-hydrofluoric acid, boiled with sulphuric acid until sulphur trioxide is evolved, and then be diluted for further treatment.

D. A. L.

Analysis of Ferro-silicons and Silico-spiegel. By FRED IBBOTSON and HARRY BREARLEY (*Chem. News*, 1900, 82, 269—270).—Ferro-silicon and silico-spiegel not being amenable to treatment with copper solutions, the *total carbon* is estimated by combustion in a current of oxygen; the *graphite* by treating 2—3 grams with 70—100 c.c. of nitric acid of sp. gr. 1.2, exciting, and gently maintaining the action by adding a few drops of hydrofluoric acid; the graphite is collected and washed successively with water, boiling sodium hydroxide, dilute hydrochloric acid, and again with water, and ultimately burnt in oxygen. *Silicon* is estimated by boiling 2 grams of the finely powdered alloy, until decomposition is complete, with 50 c.c. of concentrated hydrochloric acid and 10—20 c.c. of nitric acid, adding twice the volume of water, filtering at once, washing with dilute hydrochloric acid, igniting, and weighing; a correction of 0.1 per cent. for soluble silica being made. *Manganese* is estimated by dissolving 1 gram in 30 c.c. of nitric acid of sp. gr. 1.2 and 1 or 2 c.c. of hydrofluoric acid, cooling, adding 10 c.c. of water, then about 2 grams of sodium bismuthate, filtering, adding standard hydrogen peroxide, and titrating with *N*/10 permanganate (Reddrop and Ramage, *Trans.*, 1895, 57, 268). With silico-spiegels, the solution of the alloy is made up to 100 c.c., and 25 c.c. are treated with nitric acid, &c. The *phosphorus* is estimated by treating 2 grams of the finely-powdered alloy with 45 c.c. of nitric acid of sp. gr. 1.2 and 25—30 drops of hydrofluoric acid, the latter treatment being once repeated when action first subsides; when decomposition is complete, permanganate is added until manganese dioxide is precipitated, and then ferrous sulphate to clear the solution, which is filtered, treated with 6 to 7 c.c. of ammonia, precipitated with ammonium molybdate, and the lead molybdate weighed (compare *Abstr.*, 1900, ii, 757); any phosphorus in the hydrofluoric acid must be allowed for.

D. A. L.

Estimation of Tungsten in Steel and Steel-making Alloys. By FRED IBBOTSON and HARRY BREARLEY (*Chem. News*, 1900, 82, 224—225).—Five grams of the steel or alloy are digested below the boiling point in 100 c.c. of strong hydrochloric acid with nitric acid in quantity only slightly above that required to keep the iron in the ferric state; the solution is boiled until the tungsten trioxide commences to separate, it is then diluted with at least twice its volume of water, and boiled. The precipitate of tungsten trioxide, silica, and a little iron is further treated. When ferro-tungstens are treated in this way, the tungsten remaining in solution must be recovered by

evaporation and included. With nickel-tungstens, hydrofluoric and nitric acids are required, the latter being ultimately expelled by boiling with sulphuric acid; the solution is then diluted and filtered, and the tungsten trioxide weighed whilst the nickel is estimated cyanometrically. If silica and molybdenum are also to be determined in the nickel-tungstens, hydrochloric and not hydrofluoric acid is used. Tungsten-molybdenum steels are treated in quantities of from 2 to 3 grams with hydrochloric and nitric acids, evaporated to pastiness, boiled with dilute hydrochloric acid, the tungsten trioxide weighed, and the molybdenum estimated as lead molybdate (Abstr., 1900, ii, 766).

In addition to the ordinary constituents in tungsten powders, a substance in the form of bronze to brown cubes or tetrahedra of a specific gravity of 7.3 has been isolated, by sifting through a 60 mesh sieve, boiling some portion with sodium hydroxide, washing, drying, digesting with nitrohydrofluoric acid, and washing and boiling the residue with sodium hydroxide.

D. A. L.

Schöffel's Process for Estimating Tungsten in Steel. By ERNEST BAGLEY and HARRY BREARLEY (*Chem. News*, 1900, 82, 270—271).—In working by Schöffel's method (Abstr., 1880, 288), the residue is liable to contain a variety of substances which are largely eliminated by using the following modification. Five grams of the sample are digested at the boiling point, and occasionally shaken with 50 grams of crystals of cuprammonium chloride, 100 c.c. of water, and 50 c.c. of strong hydrochloric acid; a little while after the precipitated copper has dissolved, the solution is filtered and the residue washed with dilute hydrochloric acid, ignited, silica volatilised by treatment with hydrofluoric acid, the residue fused with sodium carbonate, dissolved in water, and the ferric oxide ignited, &c. The filtrate, if yellow, is acidified with sulphuric acid, treated with ferrous sulphate, titrated with permanganate, and calculated into chromic oxide; this, together with the ferric oxide, is deducted in order to obtain the percentage of tungsten. With less than 1 per cent. of tungsten, only 10 per cent. of hydrochloric acid should be used in the cuprammonium solution, otherwise the results obtained may be low. Molybdenum, if present, may or may not pass into solution; part of the silicon also is dissolved; silicon cannot therefore be estimated by the loss on treatment with hydrofluoric acid.

D. A. L.

Analysis of Uranium and Vanadium Ores. By OLIVER P. FRITCHLE (*Chem. News*, 1900, 82, 258).—The method is particularly adapted to the analysis of carnotite. Half a gram of the finely powdered ore is moistened with water, digested at a 'slow boiling temperature' for an hour with 10 c.c. of nitric acid, diluted with 10 c.c. of water, and neutralised with a saturated solution of sodium carbonate, of which 5 c.c. in excess is then added, along with 20 c.c. of a 20 per cent. solution of sodium hydroxide; the whole is boiled slowly for half an hour and allowed to settle. The precipitate containing the iron and uranium is collected, washed with a solution of sodium hydroxide, and dissolved in 20 c.c. of hot (1 : 1) nitric acid; the solution is treated with 40 c.c. of water, then with ammonia, until a permanent precipi-

tate begins to form, finally with 40 c.c. of a fresh saturated solution of ammonium carbonate, and heated to boiling for a few minutes; it is then filtered and washed with a 2 per cent. solution of ammonium carbonate. The filtrate is treated with 20 c.c. of sulphuric acid (1 : 1), boiled until dense fumes are evolved, cooled, diluted to 100 c.c., and boiled with strips of aluminium until the colour becomes sea-green, when the uranium is titrated with permanganate. The iron precipitate is dissolved in hydrochloric acid, boiled with sulphuric acid until dense fumes are evolved, reduced with aluminium, and titrated. For vanadium, half a gram of ore is moistened with water, boiled with 10 c.c. of nitric acid and 10 c.c. of sulphuric acid until the dense fumes appear, reduced with aluminium and titrated; the number of c.c. required less those obtained for the iron and uranium gives the quantity of vanadium.

D. A. L.

New Method for the Volumetric Estimation of Bismuth. By GUSTAV FRERICHS (*Chem. Centr.*, 1901, i, 277; from *Apoth. Zeit.*, 15, 859).—In order to estimate the amount of bismuth in surgical dressings, &c., the sulphide obtained by precipitating with hydrogen sulphide from an acid solution is treated with an excess of *N*/10 silver nitrate solution (1 c.c. = 0.00693 Bi) and 10 c.c. of dilute nitric acid, the volume made up to 100 c.c., the mixture well shaken and 50 c.c. of the filtrate titrated by Volhard's method.

Almost all the metallic sulphides react quantitatively with silver nitrate in a similar manner, forming silver sulphide and the nitrate of the metal.

E. W. W.

Estimation of Oxidisable Substances in Water. By ERNST RUPPIN (*Zeit. Nahr.-Genussm.*, 1900, 10, 676—681).—The author has made a number of experiments to ascertain the influence exercised by chlorides in the estimation of oxidisable organic matters in waters by means of potassium permanganate and has tabulated the results. The experiments were made by adding 9 c.c. of solution of permanganate (0.313 gram of potassium permanganate per litre) to the boiling solution and boiling for 10 minutes; the undecomposed permanganate was then titrated. The liquid was made either acid or alkaline and contained a varying amount of sodium chloride.

From the first series of experiments made with an acid solution, it appears that so long as the amount of chlorine does not exceed 0.200 gram per litre it has no perceptible influence on the titration, but when that amount is exceeded, it rapidly makes its influence felt, so that when it reaches 1.6 grams it accounts for 1.01 c.c. of permanganate, whilst 10 grams destroy 7.15 c.c.

Experiments in which a solution of tartaric acid was used (0.010 gram per litre) with varying amounts of sodium chloride gave similar results, although the action was less marked. As may be expected, the addition of sodium chloride does not affect the titration in an alkaline solution.

Further experiments were made to determine the influence of manganous sulphate, 1 c.c. of a solution of manganous sulphate (200 grams per litre) was added to the water, and also to solutions containing 0.003—0.015 gram of tartaric acid per litre, and it was found that this

was sufficient to prevent the interfering action of chlorine, even if this is present to the extent of 4 grams per litre.

A remarkable result was obtained with water to which a few drops of meat-peptone had been added, but which was free from sodium chloride. It was oxidised in acid solution, in alkaline solution, and in an acid solution with addition of manganous sulphate. The results were respectively 8.23, 22.30, and 11.24 c.c. of permanganate.

L. DE K.

Analysis of Acetylene. By ARNOLD ROSSEL and E. LANDRISET (*Zeit. angew. Chem.*, 1901, 77—82).—A generating flask of 5—6 litres capacity, provided with a safety funnel and gas-delivery tube, is filled with water and calcium carbide is added until the water is saturated with acetylene. After temporarily closing the delivery tube, about 20 grams of the sample of calcium carbide are added, the funnel is inserted, and the gas after passing through a calcium chloride tube is collected over mercury in a Hempel burette. After absorbing the acetylene as usual by means of sulphuric acid, the residual gas is tested for oxygen, hydrogen, methane, and nitrogen by the well-known Hempel methods. Ammonia is always present, more particularly if much magnesium carbide is present. It is a curious fact that when the carbide is thrown into an excess of water no hydrogen sulphide is evolved, whilst by allowing water to drop on to the lumps, the greater part of the sulphur present is evolved as hydrogen sulphide or other thio-compounds. A new apparatus is described for the estimation of the sulphur and phosphorus in calcium carbide.

L. DE K.

Action of Denigès' Acetone Reagent on Terpenes. By CARL GLÜCKSMANN (*Chem. Centr.*, 1901, i, 135; from *Zeit. Oesterr. Apoth.-V.*, 38, 1085).—Denigès' reagent, a solution of 5 grams of mercuric oxide in a hot mixture of 20 c.c. of concentrated sulphuric acid and 100 c.c. of water, is not a specific reagent for ketones or aldehydes, since it gives white precipitates when shaken with oil of turpentine and the majority of the ethereal oils.

The precipitate seems to contain a mercurous compound, and it is suggested that mercuric sulphate might prove a convenient mild oxidising reagent.

M. J. S.

Estimation of Cyanides and Cyanates. By J. W. MELLOR (*Zeit. anal. Chem.*, 1901, 40, 17—21).—Commercial potassium cyanide may be analysed by the following methods. A solution of 20 grams of the substance in 100 c.c. of water is mixed with calcium nitrate to precipitate carbonates, and the filtrate is made up to 200 c.c. The cyanogen is estimated in 10 c.c. by Denigès' modification of Liebig's method (*Abstr.*, 1896, ii, 385). For the cyanate, 10 c.c. of the solution are mixed with an excess of concentrated silver nitrate solution and the precipitate is washed with ice-cold water. It is then treated with p c.c. of N nitric acid, warmed to 50° , and filtered. The acid in the filtrate is titrated with N sodium hydroxide, n c.c. being required. The percentage of potassium cyanate is then $4.05(p - n)$.

M. J. S.

Wine Analysis. By FRIEDRICH BOLM (*Zeit. Nahr.-Genussm.*, 1900, 10, 667—676).—*Specific gravity and estimation of alcohol.*—As a 50 gram specific gravity bottle is rarely absolutely correct, it is necessary to ascertain its exact capacity ; the weight of the wine or of its distillate is then divided by the weight of the water. To save the correction, the author simply deducts 50 grams from the weight of the bottle filled with water at 15.5°, calls the difference the weight of the empty bottle, and then uses it in wine analysis as if it were perfectly correct. Provided the bottle holds an amount of water not greatly differing from 50 grams, the results will be correct to the fourth decimal. *Estimation of the extract.*—In order to prevent the extract from absorbing moisture, the platinum dish is cooled in a desiccator containing asbestos or pumice moistened with sulphuric acid and then introduced into a suitable weighing glass. *Estimation of the mineral constituents.*—As the ash is hygroscopic, the crucible should be inserted in a weighing glass. In the author's opinion it is unnecessary to moisten with ammonium carbonate and to again dry ; treatment of the moist ash with free carbon dioxide should be resorted to. *The normal solutions.*—*N/3* soda is recommended for estimating the acidity &c., and a table and suitable formulæ are given to facilitate the calculations. *Estimation of the sugar.*—Reference is made to a former paper by the author (*ibid.*, 1899, 2, 689). It is stated that it is not strictly necessary to remove tannins before applying the copper test. Attention is again called to the great difficulty of obtaining cuprous oxide free from contaminating organic matters. L. DE K.

Examination of Glycerol. By CALIXTE FERRIER (*Chem. Centr.*, 1901, i, 136 ; from *Mon. Sci.*, [iv] 14, ii, 808).—Owing to the presence of fusible salts, it is impossible to completely incinerate the carbonaceous residue of commercial glycerol without serious loss of mineral matter by volatilisation.

The charred residue should therefore be crushed and exhausted with water, the solution being withdrawn by a capillary pipette which does not admit the solid particles. The carbon then burns easily, the solution is added to the ash, evaporated, and gently ignited.

M. J. S.

Analysis of Surgical Dressings. By GUSTAV FRERICH (S. 1) (*Chem. Centr.*, 1901, i, 209—210 ; from *Apoth.-Zeit.*, 15, 832, 839, 849).—In commercial analyses of surgical dressings, it is usual to report the amount of the antiseptic constituent per 100 parts of the unimpregnated fabric. It is therefore necessary to dry and weigh the fibre after exhaustion with appropriate solvents, and allow for 5 per cent. of moisture in the original material.

Carbolic Acid Dressings.—Koppeschaar's method, as modified by Beckurts, is used ; 10 grams of the dressing are extracted with 500 c.c. of cold dilute sodium hydroxide ; 50 or 25 c.c. are mixed in a stoppered bottle with 50 c.c. each of potassium bromide (5.94 grams per litre) and potassium bromate (1.667 grams per litre), and 5 c.c. of concentrated sulphuric acid. After 15 minutes, a gram of potassium iodide is added, and the iodine titrated by *N/10* thiosulphate.

Salicylic Acid is estimated in a similar manner (compare Freyer, Abstr., 1897, ii, 608).

Iodoform.—Lehmann's method is used (Abstr., 1900, ii, 372, 776; this vol., ii, 42).

Mercuric Chloride.—For undyed dressings, Beckurts' process may be used; 20 grams of the dressing and 0.5 gram of sodium chloride are treated with 500 c.c. of water. To 250 c.c. of the solution, diluted to 500 c.c., 0.2 gram of ferrous sulphate and an excess of sodium hydroxide are added; the mixture is then acidified with sulphuric acid, an excess of *N*/100 iodine is added, and the excess titrated by thiosulphate. If the fabric is dyed, the mercury must be precipitated as sulphide, the sulphide be treated with *N*/100 iodine, sulphur removed by carbon disulphide, and the iodine titrated.

Boric Acid.—Beckurts' and Danert's method (*Apoth.-Zeit.*, 12, 159; *Chem. Centr.*, 1897, i, 771). *Bismuth*.—See this vol., ii, 201.

Preparations containing iodine are treated in a nickel capsule with sodium hydroxide and alcohol, the mixture dried at 150° and charred. It is then treated with water and nitric acid, and the iodide in an aliquot portion titrated by Volhard's process. Aristol and europen should be first mixed with 4—6 parts of starch.

Preparations containing silver are incinerated and the silver titrated by Volhard's thiocyanate method. M. J. S.

Estimation of Milk Sugar by Polarisation and Reduction. By ANTON SCHEIBE (*Zeit. anal. Chem.*, 1901, 40, 1—14).—The difference between the results of the optical and reduction methods, when applied to the estimation of milk sugar in milk, which by some observers has been attributed to the presence of a second optically active constituent, disappears completely if due regard is paid to the following considerations, and a process based on them is adopted. The volume of the precipitate produced when freeing the milk from casein must not be neglected. This precaution is more necessary for the optical method than for the reduction method, in consequence of the much greater dilution employed in the latter. The calcium in the milk must be removed, since its presence diminishes the amount of copper reduced by milk sugar. The use of lead acetate for precipitating the proteids must be abandoned, since the optical rotation of milk sugar is influenced by that salt. The volume of the precipitate can be ascertained by adding to the milk a known amount of milk sugar and observing its influence on the optical rotation; calcium may be removed by sodium fluoride, and the lead acetate replaced by a solution of mercuric iodide. The two processes are then conducted as follows. *Gravimetric estimation*: 25 c.c. of milk diluted with 400 c.c. of water are mixed with 10 c.c. of copper sulphate solution (69.28 grams per litre), then with 3.5—4 c.c. of *N* sodium hydroxide and 20 c.c. of a cold saturated solution of sodium fluoride. After half an hour, the whole is made up to 500 c.c.; 100 c.c. of the filtrate are mixed with 50 c.c. of Fehling's solution, boiled for 6 minutes, and the cuprous oxide collected, reduced with hydrogen, and weighed. Soxhlet's table (*Zeit. anal. Chem.*, 20, 436) gives the corresponding amount of milk sugar. *Polarimetric estimation*: 75 c.c. of milk are mixed with 7.5 c.c.

of 20 per cent. sulphuric acid and 7.5 c.c. of mercuric iodide solution (made by dissolving 40 grams of potassium iodide in 200 c.c. of water, shaking with 55 grams of mercuric chloride, making up to 500 c.c., and filtering). The mixture is made up to 100 c.c. and the filtrate polarised. In a second quantity of 75 c.c. of milk, 10 grams of milk sugar ($=M^1$ grams as estimated by polarisation, after mixing with sulphuric acid and mercuric iodide exactly as in the experiment with the milk) are dissolved by warming; after cooling, 0.5 c.c. of strong ammonia is added to destroy mutarotation, and, 10 minutes later, sulphuric acid and mercuric iodide are added as before, and the filtrate polarised. Subtracting the rotation due to the milk alone, the difference (M^2) gives the uncorrected amount of the milk sugar added. The volume (V) of the precipitate is then $100M^2 - 100M^1/M^2$, and the true amount of milk sugar in the milk is obtained by multiplying the apparent amount by $1 - 0.01V$, which for whole milk has the average value 0.94, and for skimmed milk 0.97, but for very rich milk, cream, and colostrum must be specially determined. M. J. S.

Estimation of Sugar by Fehling's Solution. By F. UTZ (*Chem. Centr.*, 1901, i, 277; from *Pharm. Zeit.*, 1900, 45, 998—999).—De Haen's method is recommended, but the cuprous oxide after filtering, washing, and calcining is dissolved in nitric acid and titrated. E. W. W.

Estimation of Cellulose, &c., in Plants, &c. By WILHELM HOFFMEISTER (*Landw. Versuchs-Stat.*, 1901, 55, 115—116).—A reply to Kleiber (*Abstr.*, 1900, ii, 630; compare Hoffmeister, *ibid.*, 1898, ii, 148 and 544). N. H. J. M.

A Reaction of Apiole. By ARMAND JORISSEN (*Chem. Centr.*, 1901, i, 135; from *J. Pharm. Liège*, 7, Oct., 1900).—A dilute alcoholic solution of apiole when treated with chlorine until turbidity is produced, and then with a few drops of ammonia, acquires a transient, brick-red colour. M. J. S.

Volumetric Estimation of Aldehydes. By MAXIMILIAN RIPPER (*Monatsh.*, 1900, 21, 1079—1085).—Twenty-five c.c. of 0.5 per cent. aqueous solution of the aldehyde are mixed with 50 c.c. of standard potassium hydrogen sulphite solution (12 grams per litre) and left for 0.25 hour, the amount of sodium hydrogen sulphite uncombined with the aldehyde is then titrated by the aid of $N/10$ iodine solution. It is not advisable to use stronger solutions of the aldehyde or sulphite than those stated. The method has given good results with formaldehyde, acetaldehyde, benzaldehyde, and vanillin. If the iodine solution contains a considerable amount of potassium iodide in solution, namely, 3 times the weight of the iodine, it may be kept for several months without altering.

A little alcohol may be added to facilitate the solution of the aldehyde, but must never reach 5 per cent. J. J. S.

A New and Sensitive Reaction for the Detection of Formaldehyde and of Lactose in Milk. By E. RIEGLER (*Chem. Centr.*, 1901, i, 206; from *Pharm. Centr. Halle*, 1900, 40, 769).—Formaldehyde and other aldehydes yield a rose-red coloration with phenylhydrazine hydrochloride and sodium hydroxide. About 2 c.c. of milk, 2 c.c. of water, and 0.1 gram of solid phenylhydrazine hydrochloride are placed in a test-tube and shaken until the latter has dissolved, whereon 10 c.c. of 10 per cent. sodium hydroxide solution are added, and the mixture again shaken for half a minute. Normal milk gives no coloration, but milk to which 2 drops of formalin per 100 c.c. have been added acquires a rich rose-red colour in 2—3 minutes. If the same process is repeated with the addition of a little sodium acetate and the mixture is then boiled before adding the soda, the red colour indicates the presence of lactose. M. J. S.

Estimation of Vanillin in the presence of Piperonaldehyde. By JOS. HANUŠ (*Zeit. Nahr.-Genussm.*, 1900, 10, 657—667).—A measured quantity of the solution representing about 0.02—0.15 gram of vanillin is introduced into a 150 c.c. Erlenmeyer flask, 10 c.c. of a 10 per cent. hydrochloric acid solution of platonic chloride are added, and the whole diluted to 50—100 c.c. The flask is heated in a water oven at 70—80° for 1 hour, and then allowed to cool for another hour. The condensation product is collected on asbestos contained in a Gooch crucible, washed until all hydrogen chloride is removed, dried for 3 hours at 100—105°, and weighed. When the amount of vanillin does not exceed 0.06 gram, the quantity represented by the precipitate is calculated by means of the equation $x = y + 15.7/0.97$, but if over 0.06 the formula $x = y + 38.25/1.04$ is employed, in which x equals the vanillin and y the weight of the precipitate.

Piperonaldehyde is not precipitated by platonic chloride, and the process is, therefore, a very suitable one for the estimation of vanillin in the presence of moderate quantities of it. The platonic chloride may be readily recovered from the filtrate and used again.

L. DE K.

The Sensitiveness and Trustworthiness of Certain Methods of Detecting Citric and Tartaric Acids and of One of these in presence of the Other. By GIULIO PARIS (*Chem. Centr.*, 1901, i, 205—206; from *Staz.sperim.agrar. ital.*, 1900, 33, 486).—Athenstädt's method (*Arch. Pharm.*, 1884, 22, 230) gives trustworthy results if freshly filtered saturated lime-water is used and access of atmospheric carbon dioxide prevented. Even 0.007 gram of tartaric acid in 1 gram of citric acid gives a distinct turbidity and the same amount produces a feeble blue coloration by Crismer's method (*Abstr.*, 1892, 546). Pusch's test (*Abstr.*, 1885, 445) is disturbed by the presence of tannic acid or of sugar. Salzer's test (*Abstr.*, 1888, 996) employed in the cold shows about the same limit of sensitiveness as that of Pusch. Mohler's method as modified by Denigès (*Abstr.*, 1896, ii, 80) gives a distinct coloration with 7 per mille of tartaric acid. The best tests are those of Denigès and Mann (*Abstr.*, 1885, 843). M. J. S.

Detection of Cinnamic Acid in presence of Benzoic Acid. By ARMAND JORISSEN (*Chem. Centr.*, 1901, i, 136; from *J. Pharm. Liège*, 7, 185).—Under the influence of light, cinnamic acid is oxidised by uranyl salts to benzaldehyde, which can be recognised by its odour. One gram of benzoic acid is boiled with 10 c.c. of water, the solution cooled, treated with 4 c.c. of a 5 per cent. solution of uranyl acetate, and the mixture exposed to direct sunlight. One per cent. of cinnamic acid can be detected.

M. J. S.

Source of Error in Testing Wine for Salicylic Acid. By HENRI PELLET (*Chem. Centr.*, 1900, ii, 1293—1294; from *Ann. Chim. anal. appl.*, 5, 418).—It has been shown by Ferreira da Silva that certain wines free from salicylic acid give up both to ether and to light petroleum a substance which gives the reactions of that acid. The substance is, however, insoluble in a mixture of equal volumes of ether and petroleum, which ought therefore always to be used for the extraction.

M. J. S.

Oleum Cacao. By P. WELMANS (*Chem. Centr.*, 1901, i, 194; from *Pharm. Zeit.*, 1900, 45, 959—961).—In reference to the data given by the new German pharmacopœia, the author points out that pure oleum cacao, obtained by pressing the roasted seeds deprived of their pods, generally melts at 34—35°, and in exceptional cases at 33—36°, whilst that obtained by extracting with ether or light petroleum melts at 30—34°, and the fats extracted from pods, &c., have even lower melting points. The fat should be introduced into the melting point tube in a solid form, and not previously melted. The iodine number of pressed fats is usually 34—36, the extracted fats only showing the wider limits 34—38. Determinations of the acid number and the saponification number are also useful in detecting rancidity and impurities.

The iodine number of pure cod liver oil is sometimes as high as 170.

E. W. W.

Halphen's Reaction for Cotton Seed Oil. By EDUARD WRAMPPELMEYER (*Zeit. Nahr.-Genussm.*, 1901, 4, 25—26).—The author does not approve of Soltsien's modification of the Halphen test (*Abstr.*, 1899, ii, 823), in which the amyl alcohol is dispensed with. The substitution of hot water for brine and the use of a condensing tube are, however, recommended. The author now operates as follows. A thick-walled test-tube 2.5 cm. wide and about 15 cm. long, and having a 10 c.c. mark, is filled to the mark with the oil to be tested, and an equal volume of amyl alcohol and 2 c.c. of a 1 per cent. solution of sulphur in carbon disulphide are added. The tube is then closed with a cork through which passes a glass tube 1.5 m. long and $\frac{3}{4}$ cm. wide, and the tube is inserted in the boiling water-bath for $\frac{1}{4}$ hour, when in the presence of even 5 per cent. of cotton seed oil, the characteristic red colour will make its appearance.

L. DE K.

Zeiss' Butyro-refractometer. By JOHN WHITE (*J. Soc. Chem. Ind.*, 1900, 19, 1089—1090).—A table is given showing the scale divisions observed in the Zeiss butyro-refractometer for butter, lard,

margarine, olive oil, rape oil, refined cotton seed oil, sesamé oil, castor oil, raw linseed oil, sperm oil, cod liver oil, and mineral lubricating oil at 25°, 40°, and 45°.

To calculate the scale divisions at any observed temperature up or down to any other temperature, a correction of 0.55 scale division should be made. The scale divisions or degrees may be calculated to the actual refractive index; a refractive index of 1.4220 corresponds with 0° and 1.4895 with 100°.

L. DE K.

Examination of Butter and Fats. By ALBERT REYCHLER (*Bull. Soc. Chim.*, 1901, [iii], 25, 142—144).—In the ordinary Reichert-Meissl process, the distillate containing the fatty acids is filtered before titration, and the Reichert number thus has reference only to the acids which are both volatile and soluble in water. If, however, the unfiltered distillate is mixed with half its volume of alcohol, the acids insoluble in water are dissolved, and titration then gives the total volatile acids, both soluble and insoluble. The ratio of the soluble volatile acids to the total volatile acids is found to be 0.90 for butter fat and 0.32 for coco fat, whilst intermediate figures are obtained in the case of margarine and lard.

N. L.

Estimation of Fat in Fæces. By H. LÜHRIG (*Chem. Centr.*, 1901, i, 137—138; from *Pharm. Centr. Halle*, 41, 721. Compare Abstr., 1900, ii, 223; and this vol., ii, 78).—A contradiction is given to Oefele's statement that the author has regarded the total ethereal extractive matter as fat. The lecithin was estimated by extracting with alcohol and determining the phosphoric acid in the ash of the alcoholic solution; from this the lecithin was then calculated by multiplying by 7.27. Assuming this to be present as distearyllecithin, the amount of free fatty acid produced by saponification was obtained. Subtracting this from the total amount of insoluble fatty acids, the remainder gave the pure fats. Another method is to saponify the ethereal extractive matter by alcoholic potash and remove the portion insoluble in alcohol and hot water. The filtrate, freed from alcohol, is then shaken with light petroleum, the residue from the petroleum solution again saponified, and shaken once more with petroleum. The petroleum solution is washed with water to remove soap, and evaporated. The fatty acids are then precipitated from the soap solutions. The fatty acids in the ethereal extractive matter vary from 45 to 81 per cent., the lecithin from 23 to 34, and the non-saponifiable constituents soluble in petroleum from 0.8 to 42 per cent.

M. J. S.

Assay of Bees-Wax. By GEORG BUCHNER (*Chem. Zeit.*, 1901, 25, 21—22, 37—39).—Some waxes show abnormal acidity, ether, and saponification numbers, but do not give any reaction for stearic acid, glycerides, resins, paraffins, &c. No wax should therefore be condemned merely because the constants are abnormal, but in such a case, and even when they are normal, the sample should be tested for these admixtures.

The author tests for stearic acid in the usual way by boiling with alcohol and diluting the cold filtrate with water; or instead of water,

an alcoholic solution of lead acetate or calcium chloride may be used, which will detect the presence of as little as 0.2 per cent. of stearic acid. Glycerides, if present in large amounts, may be detected by the odour of acraldehyde, obtained on fusing the sample with potassium hydrogen sulphate; if small quantities are looked for, the sample is saponified with alcoholic potassium hydroxide, the alcohol is expelled, and the residue extracted with water; the solution is then evaporated, and the residue tested for glycerol as before. For the detection of the other adulterants, the author refers to a previous paper (*Abstr.*, 1896, ii, 456) and also to the processes devised by Weinwurm and by Storch, and finally to Werder's method (this vol., ii, 139).

Attention is called to the fact that in order to get trustworthy results with the conventional saponification method, the potassium hydroxide should be dissolved in absolute alcohol and the strength of the other alcohol used in the process should be 96 per cent.

To facilitate the work, when large numbers of samples have to be tested, 3.6 grams of the sample are operated on and an alcoholic solution of potassium hydroxide is used of such a strength that 20 to 22.5 c.c. neutralise 20 c.c. of *N*/2 sulphuric acid. Reference can then be made to a table from which the acidity or other number is read off.

L. DE K.

Estimation of Methyl Anthranilate in Essential Oils. By ALBERT HESSE and OTTO ZEITSCHER (*Ber.*, 1901, 34, 296—300).—The oil is dissolved in 2—3 times its weight of dry ether, the solution cooled to at least 0°, a mixture of concentrated sulphuric acid and ether (1:5 by vol.) added until no further precipitate of methyl anthranilate sulphate is formed, and the precipitate filtered and washed thoroughly with dry ether. If it is small in amount, it is dissolved in water, and the sulphuric acid titrated with *N*/2 potassium hydroxide and phenolphthalein; the solution is heated with excess of *N*/2 alcoholic potassium hydroxide, and the excess of alkali titrated with *N*/2 sulphuric acid. Each 1 c.c. of alkali used in the hydrolysis corresponds with 0.0755 gram of methyl anthranilate; if the alkali used in the hydrolysis is less than half that used in the first titration, bases not susceptible of hydrolysis must also be present; they may be extracted with ether from the alkaline liquid after hydrolysis. From the residual liquid, the anthranilic acid can be obtained by evaporating, acidifying with acetic acid, and extracting with ether, and can be identified by its melting point, which remains unchanged when the substance is mixed with some pure anthranilic acid.

If the quantity of precipitate is larger, it is dissolved in water, and an aliquot part titrated as above; the bulk of the solution is freed from resinous matter by extraction with light petroleum, and neutralised with sodium carbonate; the precipitate then formed is dissolved in ether, and saturated with dry, gaseous hydrogen chloride. Methyl anthranilate hydrochloride is precipitated, and can be identified by its melting point; other bases may remain dissolved in the acid ethereal solution.

Experiments were made with mixtures containing 5, 1, and 0.25 per cent. of methyl anthranilate; the amounts found were 5.10, 1.04,

and 0.227 per cent. A sample of oil of neroli was found to contain about 0.6 per cent. of the ester.

C. F. B.

Estimation of Urea. By HUGO POLLAK (*Pflüger's Archiv*, 1901, 83, 232—240).—Schöndorff's method of estimating urea is compared with that introduced by Freund and Töpfer; the latter method gives rise to some loss.

W. D. H.

Some Colour Reactions of Citrophen, Phenacetin, Methacetin, Acetanilide, and Exalgin with Potassium Permanganate. By J. J. M. MAAS (*Chem. Centr.*, 1900, ii, 1215; from *Ned. Tydschr. Pharm.*, 12, 321).—If a trace of these compounds is mixed with 1 c.c. of *N* sodium hydroxide and a few drops of a 1 per cent. solution of potassium permanganate are added, a violet colour appears which turns blue and then green; on supersaturating with sulphuric acid, the colour turns red and rapidly fades. If sodium carbonate is substituted for the hydroxide, citrophen [citrotriphenetidine] reacts at once, phenacetin and methacetin [*p*-acetylanisidine] slowly, acetanilide and exalgin [methylacetanilide] not at all; on substituting sodium hydrogen carbonate, only citrophen gives a reaction. An acid solution is only affected by citrophen and phenetidine. The other compounds decolorise an acid solution of potassium permanganate after some time.

L. DE K.

A New Artificial Colouring Matter in Wine and the Detection of Orchil, Cochineal, Phytolacca, and Beet-root Red in Wine. By J. BELLIER (*Chem. Centr.*, 1900, ii, 1296—1297; from *Ann. Chim. anal. appl.*, 5, 407).—Dyes more difficult to detect than those formerly used are now often added to wine. Such a one is the so-called "Orchil Red," a mixture of orchil with indigo-carmin. When present in wine, it gives a colourless filtrate with mercuric acetate, and is not taken up by amyl alcohol, but it betrays its presence by a bright red colour on adding excess of borax or ammonia. It may be separated from the wine by adding albumin, or a feebly ammoniacal casein freed from fat. The precipitate is washed, pressed between filter paper, and while still moist shaken with 86 per cent. alcohol containing 3—4 per cent. of ammonia. The solution is evaporated to dryness, the residue dissolved in water, re-evaporated, and extracted with 95 per cent. alcohol. A red alcoholic solution and a blue residue, soluble in water, are obtained.

A general scheme for the examination of a wine for artificial colouring matters may take the following form. The wine is first tested by mercuric acetate and magnesia for coal-tar dyes. A reagent is then prepared with 5 grams of mercuric oxide, 10 grams of ammonium sulphate, 15 c.c. of ammonia of sp. gr. 0.92, and water to 50 c.c. Ten c.c. of the wine are shaken with 1 c.c. of this reagent, or more if the wine is strongly acid. Pure wines become colourless, yellowish, or grey; wines containing a dye give a red filtrate. A very sensitive reagent consists of two solutions, the first containing 10 grams of mercuric chloride, 5 grams of ammonium chloride, and 100 c.c. of water, the second of 10 c.c. of glacial acetic acid, 65 c.c. of water, and 25 c.c. of ammonia (0.92). Ten c.c. of the wine are shaken with 1 c.c. of the

first, then 1 c.c. of the second added, shaken again, and filtered. The colour of the filtrate is to be observed immediately, as it becomes orange-yellow later. For further testing, the filtrate is halved, one part treated with lime water, shaken, and half an hour later acidified with acetic acid; a red coloration indicates orchil or cochineal; the latter gives a red filtrate, orchil a colourless one, when 10 c.c. of the wine are shaken with 0.2—0.3 gram of stannous chloride and excess of calcium carbonate. The other half is treated with ignited magnesia and then acidified with acetic acid; beet-root gives a red filtrate; phytolacca a colourless one.

M. J. S.

Adulteration of Saffron; "Saffron Essence." By WILHELM FRESSENIUS and LEO GRÜNHUT (*Zeit. Nahr.-Genussm.*, 1900, 3, 810—819).—A report on the adulteration of two samples of saffron, and of a liquid which had apparently been used for adulterating the second sample. In analyses of this kind, it is not sufficient to merely estimate the moisture and the ash and call the balance dry saffron, but a complete analysis of the mineral matter should be made by operating on the sample itself and not on the ash.

The result of the analysis of the first sample was as follows: Crystallised magnesium sulphate, 25.5; crystallised borax (10 aq.), 8.23; crystallised normal sodium borate (8 aq.), 17.49; and saffron, 48.78 per cent.; total mineral adulterants, 51.32 per cent. The second sample showed: potassium nitrate, 12.94; crystallised normal potassium borate, 20.86; crystallised normal sodium borate, 6.41; sodium hydroxide, 3.21; saffron, 56.58 per cent.; total mineral adulterants 43.42 per cent. In this calculation, it was assumed that in the presence of much free alkali normal sodium borate crystallises with four instead of eight and neutral potassium borate with three instead of four H_2O . It will be readily seen that, owing to these salts retaining part of the water at 100°, and to absorption of carbon dioxide during the drying, an estimation of moisture in the ordinary way would have given erroneous results. The ash would also not have represented the true mineral matter. The result of the analysis of the so-called "Saffron Essence," of which full analytical details are given, was as follows: water, 46.57; crystallised borax, 16.87; potassium hydroxide, 8.94; potassium nitrate, 10.03; saffron (extract), 0.40; sucrose, 9.91; dextrose, 1.65; and dextrin (by difference), 5.63 per cent. The authors are not aware for what purpose it is intended to be used.

L. DE K.

Cryoscopic Testing of Medicines. By ALEXANDER VON POHL (*Chem. Centr.*, 1900, ii, 1294; from *Pharm. Post*, 33, 621—623).—The cryoscopic method of testing medicines is recommended as an addition to the usual tests, and is especially useful in the case of solutions of alkaloids, as it involves no loss of material.

E. W. W.

Characteristics of Ovalbumin, Serum-albumin (Sérines), and Serum-globulin. By GABRIEL GUÉRIN (*J. Pharm.*, 1900, [vi], 12, 465).—When 15—20 per cent. of formaldehyde is added to a solution of serum-albumin, no precipitate is produced, and after a certain time the liquid loses the property of being coagulated by heat, or by nitric acid in the cold. A solution of ovalbumin, when similarly treated,

gives no precipitate on heating, but is coagulated by nitric acid in the cold. Formaldehyde produces a gelatinous precipitate in strong solutions of serum-globulin, and a flocculent precipitate in dilute solutions.

H. R. LE S.

Simple and Rapid Estimation of Humic Acid. By HUGO BORNTRÄGER (*Zeit. anal. Chem.*, 1900, 39, 790—791).—The method depends on the oxidation of humic acid by a hypochlorite. A standard humic acid solution is prepared by boiling 10 grams of Cassel brown 1a (which may be assumed to contain 98 per cent. of humic acid) with 3 grams of sodium carbonate and 100 c.c. of water for an hour, and diluting to a litre. Ten c.c. of this solution, acidified with 3 c.c. of concentrated hydrochloric acid, is employed to standardise a clear solution of bleaching powder (about 20 grams per litre), or one of sodium hypochlorite, which is added from a burette until the colour is destroyed. The substance to be assayed is then treated in exactly the same manner. M. J. S.

Analysis of Peat. By HUGO BORNTRÄGER (*Zeit. anal. Chem.*, 1900, 39, 694—698).—Peat varies greatly in composition and physical properties. Young peat is pale in colour, bulky, capable of absorbing water like a sponge, and consists mainly of vegetable fibre, but peat some centuries old, is black, much denser (3—7 times), absorbs scarcely any water, is very rich (40—50 per cent.) in humic acid, and contains from 2 to 5 times as much nitrogen as young peat. Contrary to the practice of French analysts, the author regards the estimation of the humic acid apart from the fibre as essential to a knowledge of the value of any specimen to the agriculturist or distiller. If the peat is to be used as fuel, its calorific efficiency should also be estimated. To estimate the humic acid and fibre, 1—2 grams of the peat are boiled for an hour with 5 grams of sodium carbonate and 200 c.c. of water, the fibre collected on a weighed filter, and the humic acid precipitated by acidifying the brown filtrate with hydrochloric acid and boiling. The precipitate is collected on either a paper or asbestos filter and dried at 105°. Nitrogen is present, partly as proteid, partly as ammonium humate; the total amount is estimated by Kjeldahl's process, the ammonia by distilling with aqueous sodium hydroxide either the peat itself or a sulphuric acid extract thereof. Water and ash are estimated by the usual methods; a complete analysis of the ash is almost valueless, since it consists chiefly of sand with calcium and iron compounds, whilst potash and phosphoric acid are almost entirely absent. Earth wax (0.5—1 per cent.) may be estimated by extraction with ether, but the information serves no useful purpose. M. J. S.

General and Physical Chemistry:

Determination of the Refractive Power as a Method for the Investigation of the Composition of co-existing Vapour and Liquid Phases. By E. H. J. CUNAEUS (*Zeit. physikal. Chem.*, 1901, 36, 232—238).—The author has determined the refractive power of various mixtures of carbon dioxide and hydrogen, and finds that the numbers obtained almost coincide with the values calculated from the refractive powers and the quantities of the two gases, thus confirming the observation of Ramsay and Travers (*Abstr.*, 1898, ii, 273). The small differences between the calculated and observed figures can be explained by the deviations which gas mixtures show from Amagat's density rule.

The refractive power has been applied to determine the quantities of ether and acetone present in vapour which is in contact with liquid mixtures of varying compositions of the two ingredients. The vapour phase is always richer in ether than the liquid. Small quantities of ether mixed with much acetone cause greater differences in the composition of the vapour and liquid phases than little acetone added to much ether.

Van der Waals' formula, $1/p \cdot dp/dx_v = x_v - x_l/x_v(1 - x_v)$, connecting the composition of the vapour and the liquid, and the pressure (x_v , x_l , p), is only applicable when the quantity of ether or acetone is small. The deviation is possibly due to the formation of a thin film of liquid on the glass plates of the apparatus, thus giving rise to a false observation. The author calculates that the thickness of this film is 0.00083 mm. for ether, and 0.00449 mm. for acetone. J. McC.

Spectrum of the more Volatile Gases of Atmospheric Air which are not Condensed at the Temperature of Liquid Hydrogen. By GEORGE D. LIVEING and JAMES DEWAR (*Proc. Roy. Soc.*, 1901, 67, 467—474).—Tubes showing the spectra of hydrogen, helium, and neon, as well as many less brilliant rays of unknown origin, have been examined, and the wave-lengths of all rays sufficiently strong to be seen easily or photographed with an exposure of 30 minutes have been approximately measured and tabulated. Analysis of the gas showed conclusively that hydrogen exists in sensible proportion in the earth's atmosphere. The spectrum of the volatile residue of air has been compared with that of the more volatile part of gas from the Bath spring. The latter, even if primarily derived from the atmosphere, seems to have undergone some sifting, which has affected the relative proportions of helium and neon.

As the mixture of gas investigated probably included portions of the gases that pervade interplanetary and interstellar space, the authors looked in the spectra for the prominent nebular, coronal, and auroral rays. The nebular lines were not present, and the coincidence of the coronal lines is doubtful. Several lines, however, in the spectra examined seemed to coincide with certain auroral lines. J. C. P.

Rotation Dispersion of Malic Acid. By BENEDICT WORINGER (*Zeit. physikal. Chem.*, 1901, **36**, 336—357).—In view of the anomalies of rotation in the case of malic acid, careful determinations were made for various solutions at 20°. In general, the results are of the same nature as those of Nasini and Gennari (*Abstr.*, 1896, ii, 285), but the actual numbers are considerably different, being in general higher. A curve of density against concentration is given, its accuracy being rendered probable by the fact that extrapolation leads to correct values for the density of water and of pure malic acid. Curves for specific rotation against concentration are approximately straight lines of the form $\alpha = A - Bq$, where q is the percentage of water. The values for the constants are calculated, and from them tables are constructed for the rotation at all concentrations for light of various wave-lengths. At high concentration, the solutions become laevorotatory for all rays examined, inactivity being obtained at the following values of q : red ($\lambda = 665.9$), 64.96; green ($\lambda = 533.0$), 74.02; dark blue ($\lambda = 448.2$), 86.56, but there is no concentration at which complete achromatism obtains. At the value $q = 78$, the lines for red and yellow cut, so that about this dilution anomalous dispersion is obtained, but the author does not confirm Nasini's observations of further anomalies. The variation of rotation with wave-length is in accord with the Boltzmann formula, $\alpha = A/\lambda^2 + B/\lambda^4$, and the values of the constants were calculated.

The form of surface representing rotation as a function of both wave-length and dilution is considered, and from it are deduced the results that for wave-lengths less than that of the ultra-violet line L, the rotation is positive at all concentrations, and that for no wave-length is it negative at all concentrations.

L. M. J.

Molecular Rotation of Ethyl *n*-Acyl-*l*-malates. By HANS REITTER (*Zeit. physikal. Chem.*, 1901, **36**, 129—167. Compare *Abstr.*,

	B. p.	Pressure in mm. Hg.	$d_{20}^{20}/4^\circ$.	$[\alpha]_D^{20}$	$[M]_D^{20}$.	Product of asymmetry $\times 10^6$.
Ethyl acetyl- <i>l</i> -malate.....	141.2—141.4°	13	1.1169	-22.60°	-52.43°	17
Ethyl propionyl- <i>l</i> -malate.....	150.6	12	1.0926	-22.79	-56.06	0
Ethyl <i>n</i> -butyryl- <i>l</i> -malate.....	156	12	1.0735	-22.75	-59.15	0
Ethyl <i>n</i> -valeryl- <i>l</i> -malate.....	176—177	19	1.0551	-21.38	-58.56	11
Ethyl <i>n</i> -hexoyl- <i>l</i> -malate.....	182—182.6	17	1.0420	-20.30	-58.46	26
Ethyl <i>n</i> -heptoyl- <i>l</i> -malate.....	191.6—192.2	15—16	1.0289	-19.30	-58.27	44
Ethyl octoyl- <i>l</i> -malate.....	199.4	15	1.0162	-18.21	-57.53	61
Ethyl pelargonyl- <i>l</i> -malate.....	206.8—208.4	14—15	1.0073	-17.24	-57.17	77
Ethyl decoyl- <i>l</i> -malate.....	217.2—217.6	13—14	1.0011	-16.61	-57.14	91

1895, ii, 251).—The *n*-acyl esters were obtained by the action of the acid chlorides on ethyl *l*-malate, and purified by distillation under reduced pressure. The table on p. 214 contains the physical properties of the esters examined.

The results are at variance with Gaye's hypothesis, according to which the rotatory power of a substance is proportional to its product of asymmetry.

In this homologous series, the molecular rotation rises to a maximum, reached at the butyryl derivative, then remains practically constant, showing, however, a slight progressive descent. A similar regularity has been observed in other homologous series by Tschugaëff (Abstr., 1898, ii, 274, 495).
J. McC.

Secondary Radio-activity of Metals. By HENRI BECQUEREL (*Compt. rend.*, 1901, 132, 371—373. Compare Abstr., 1900, ii, 126).—The more penetrative rays emitted by extremely active radium preparations induce a radiation in objects of lead or aluminium subjected to their influence; the induced rays are less penetrative than those emitted by the exciting substance, and resemble the secondary Röntgen rays discovered by Sagnac. The phenomenon appears to be analogous to that of fluorescence or phosphorescence.
G. T. M.

Laws of Transparency of Matter for X-Rays. By LOUIS BENOIST (*Compt. rend.*, 1901, 132, 324—327).—The examination of about 120 different elementary and compound substances has shown that the specific opacity of a substance for the X-rays is independent of its physical state and molecular condition. Thus, the opacity of water is the same as that of ice, whilst the different varieties of carbon or phosphorus behave alike. Benzaldehyde, also, has the same opacity as the polymeric benzoin. The specific opacity for X-rays is an additive property, since the observed opacities of compounds are found to be equal to the sum of the opacities of their constituent atoms. The specific opacity of the elements is an increasing function of, and approximately proportional to, their atomic weights.

N. L.

Specific Absorption of X-Rays by Metallic Salts. By ALEXANDRE HÉBERT and GEORGES REYNAUD (*Compt. rend.*, 1901, 132, 408—409).—The results published by Benoist (preceding abstract) were largely anticipated by the authors (Abstr., 1899, ii, 586). It is found that the absorbent powers of solutions of the metallic nitrates and chlorides for X-rays increase with the atomic weight of the metal, when this quantity is plotted against the relative specific absorption, the curve obtained is approximately a rectangular hyperbola. This relationship is less simple in the case of bromides, iodides, or sulphates, the influence of the electro-negative ion becoming a disturbing factor when the radicle possesses a high molecular weight. In general, the absorbent power of compounds for X-rays varies directly with their molecular weight. In any compound it is the radicle of highest molecular weight which impresses its specific absorbent power most markedly on the substance, this being true for both positive and negative radicles.
G. T. M.

Law of the Transparency of Matter for X-Rays. By LOUIS BENOIST (*Compt. rend.*, 1901, 132, 545—548. Compare preceding abstracts).—This communication contains a diagram of curves showing the connection between the atomic weights of the elements and their transparency towards X-rays of varying penetrative power. The experimental results when thus presented show the importance of taking into account the phenomenon of *radiochromism*, and the paper concludes with a criticism of the work of Hébert and Reynaud, who have made certain generalisations without considering this property of matter. G. T. M.

Action of Cathode Rays on Radio active Substances. By KARL A. HOFMANN, A. KORN, and EDUARD STRAUSS (*Ber.*, 1901, 34, 407—409. Compare this vol., ii, 19).—The sulphates of mercury, thallium, zirconium, lead, and thorium become fluorescent when exposed to the action of cathode rays emitted from a Hertzian apparatus, but do not acquire the property of acting on a photographic plate in the dark; thorium oxide, gadolinium oxide, and the rare earths from samarskite behave in a similar manner. Bismuth hydroxide and barium sulphate, niobate, titanate, and tungstate remain inert, and the bismuth preparations from pitchblende, which contain polonium but have lost their radio-activity on keeping for a long time, do not recover their property under the influence of the cathode rays.

The lead sulphate preparations from pitchblende, bröggerite, cleveite, samarskite, and uranium mica, which have lost their radio-activity by keeping, recover the property when exposed to the cathode radiations; the effect is most marked in the case of the specimens prepared from the fractions containing the most soluble chlorides, the induced activity persisting for several weeks. The lead sulphate derived from euxenite is not radio-active, but is rendered active by the cathode rays. These results justify the conclusion that the radio-active lead compounds contain a foreign element, and also that the radiations are related to the cathode rays and hence to the Röntgen rays. G. T. M.

Radio-activity Induced by Radium Salts. By P. CURIE and A. DEBIERNE (*Compt. rend.*, 1901, 132, 548—551. Compare Abstr., 1900, ii, 81, 83, 125, 126, 254, 586, 654).—The intensity of the induced radio-activity is greatly increased when the exciting material, contained in a small open vessel, is placed in the centre of an enclosed space. Sheets of various materials, when placed in different parts of this enclosure, become equally active after the same interval of time, even when placed behind leaden screens. When, however, these substances are placed either against the sides of the vessel containing the radio-active material or against the walls of the enclosure, it is found that their exterior surfaces only are rendered active. The activity induced in these sheets by a specimen of radio-active barium chloride containing a metal having an atomic weight of 174, is 8000 times as great as that exhibited by a plate of uranium of the same dimensions. The induced radio-activity persists when the plates are left in the enclosure from which the exciting material has been withdrawn, whereas it almost completely disappears in the course of a day when the materials are exposed to the air. When the substances to be rendered active

and the exciting material are placed in different enclosures connected by capillary tubes, the induced radio-activity is as intense as in the foregoing experiment. No induction can be observed, however, when the radio-active material is contained in a closed vessel, even although this is placed in the same enclosure as the plates under investigation. These results were produced to the same extent by the chloride, sulphate, and carbonate of radio-active barium, and also by actinium compounds; polonium salts, on the contrary, do not induce radio-activity. The induction is probably brought about by the action on the air of certain rays readily absorbed by this medium, the radio-activity being transmitted through the air from the exciting material to the experimental plates. The rate of increase in the radio-active intensity becomes greater as the enclosure is made smaller, the induced activity ultimately reaching a maximum value which depends on the original radio-activity of the exciting material.

G. T. M.

Influence of the Medium on the Photochemical Effect in Silver Bromide Emulsions, and Photochemical Induction. By RICHARD ABEGG [and CL. IMMERWAHR] (*Monatsh.*, 1901, 22, 88—94).—Following the investigations of Luggin (Abstr., 1897, ii, 470) and Luther (Abstr., 1900, ii, 181, 253), the author suggests that the state of equilibrium is never reached in the ordinary process of obtaining a photographic negative, because (1) the exposure is too short, and (2) the halogen set free from the silver salt does not attain the equilibrium potential, owing to the fact that it is removed either by reacting with the medium, for instance, gelatin, or by diffusion. Gelatin probably owes its use as a “chemical sensitiser” to the readiness with which it interacts with halogen. On the other hand, the diffusion of the halogen would be hindered by the gelatin. The influence of diffusion is demonstrated by exposing two similar gelatin silver bromide plates, the one with the gelatin layer, the other with the glass towards the source of light. The action on the bromide was less in the latter case, as the close opposition of the glass to the gelatin prevented the diffusion of the halogen, and consequently reduced the action of the light.

K. J. P. O.

Luminosity obtained with certain Organic Compounds. By RAPHAEL DUBOIS (*Compt. rend.*, 1901, 132, 431—432).—Many organic compounds, when warmed with alcoholic potassium hydroxide, yield solutions which are luminous in the dark; in some cases, this result is attained even with the cold reagent. The essences of camomile, rosemary, cumin, rose, and *Illicium anisatum* behave in this manner. The best result is obtained with *æsculin*; this glucoside yields a solution which remains luminous during a whole night, the luminosity increasing when the solution is shaken in the presence of atmospheric air; the fluorescence is destroyed by adding water to the alkaline alcoholic solution. Even in this case, however, the luminosity is far less than that obtained with solutions of marine photobacteria.

G. T. M.

The Electrical Arrangements of the Chemical Laboratory of the Mining School at Clausthal. By FRIEDRICH W. KÜSTER (*Zeit. anorg. Chem.*, 1901, 26, 167—174).—A description of a simple,

inexpensive, and flexible arrangement of a battery of accumulators intended to be charged from an electric lighting circuit at 110 volts and to furnish a supply of electricity for experimental purposes at any pressure from 4 to 96 volts. The advantages of the arrangement are, that all the cells are discharged simultaneously and equally, and the loss of energy in charging is reduced to a very small quantity.

T. E.

Gas Polarisation in Lead Accumulators. By C. J. REED (*J. Physical Chem.*, 1901, 5, 1—16).—In order to explain why with lead electrodes electrolysis does not take place with E.M.F.'s below 2 volts, hydrogen not being liberated until 2·3 volts is reached although the electrolyte is decomposed between platinum electrodes at 1·7 volts, Nernst and Dolezalek have considered that the E.M.F. required for the liberation of hydrogen is dependent on the occluding capacity of the metal employed (*Abstr.*, 1900, ii, 164). The author shows, however, that the anomaly does not exist, for hydrogen is liberated between lead electrodes with an E.M.F. of 0·38 volt, whilst a steady current could be obtained with 0·01 volt. Previous investigators had not used lead electrodes, but by waiting for a constant value had delayed observation until the anode had become coated with a film of lead sulphate. For the theoretical investigation also, the question must not be treated merely as a liberation of hydrogen, but the total energy absorbed by the actual chemical changes must be considered. When the anode is converted into lead sulphate, the reaction proceeds with evolution of hydrogen and formation of lead peroxide necessitating 1·73 volts, when the anode is lead peroxide, an E.M.F. of 1·95 volts is required for the production of hydrogen peroxide and 2·23 volts for the formation of persulphuric acid. If the cathode is of lead sulphate, somewhat higher values are required, and with acid of sp. gr. 1·20 the values must be increased by 0·08 volt. These values are in good accord with experimental determinations.

L. M. J.

Diminution of Cathodic Depolarisation by Potassium Chromate. By ERICH MÜLLER (*Zeit. Elektrochem.*, 1901, 7, 398—405).—The yield of chlorate in the electrolysis of a solution of an alkali chloride is much increased by the addition of a little potassium chromate to the liquid. A catalytic acceleration of the oxidation of hypochlorite to chlorate would reduce the concentration of the former in the solution, and also the quantity of oxygen escaping at the anode, whereas in reality the opposite effects are observed. The action of the chromate really consists of a diminution of reduction at the cathode. With a cathode of chromium (in a solution of potassium iodate), about 22 per cent. of the current was employed in reduction, whilst the addition of a little chromate diminished this to about 11 per cent. The diminution of the reduction does not, therefore, appear to be due to a specific action of chromium. The phenomena observed are all explicable on the supposition that a thin deposit of the oxide, Cr_2O_3 or $\text{Cr}_2\text{O}_3\cdot\text{CrO}_3$, is formed on the cathode, which prevents the reducible substance (hypochlorite, iodate, nitrate) from coming into immediate contact with it. With a platinum cathode, for example, in

a solution of potassium iodate, 50—60 per cent. of the current produced reduction; the addition of a little potassium chromate to the solution diminished this to 3 to 6 per cent. The cathode was then washed and used in a fresh solution of iodate without chromate, when 27—33 per cent. of reduction was observed. A slight yellow film containing chromium can be detected on such a cathode.

T. E.

Studies on Cathodic Polarisation and Depolarisation. By ERICH MÜLLER (*Zeit. anorg. Chem.*, 1901, 26, 1—89).—In electrolytic reduction, the nature of the metal forming the cathode often exercises a great influence on the results obtained. The potential difference required to produce visible formation of hydrogen bubbles is always greater than the potential difference of the hydrogen electrode under similar conditions, and the excess required depends on the nature of the metal. The author finds the excess *P.D.* required to produce the smallest visible quantity of hydrogen from normal sulphuric acid to be as follows: platinised platinum, 0.01 volt; smooth platinum, 0.07 volt; gold, 0.06 volt; silver, 0.05 volt; copper, 0.03 volt; nickel, 0.03 volt; mercury, 0.42 volt; palladium, 0.24 volt; tin, 0.43 volt; lead, 0.35 volt. The values are smaller than those obtained by other observers, and depend largely on the nature of the metallic surface, smooth surfaces giving higher values than rough ones. With mercury, the results were very variable and uncertain. It is interesting to note that, with the exception of palladium, the excess *P.D.* is very small for metals which are more negative than hydrogen, whilst tin and lead, which are more positive than hydrogen by 0.41 and 0.28 volt respectively, give excesses of about the same amounts.

Between a solution of any reducible substance and a metallic electrode, there exists a definite potential difference at which reduction should begin, provided that there is no retardation analogous to that observed in the evolution of hydrogen at metallic surfaces. It is therefore conceivable that the *P.D.* required for the reduction of a substance might be greater than that at which hydrogen is evolved from one metal, but less than that at which it is evolved from another. Reduction would then be observed when the second metal is used as cathode, but not with the first. By a method similar to that used for the determination of discharge potentials, the author has measured, in several cases, the lowest E.M.F. at which reduction proceeds moderately fast, that is, with a velocity comparable with the velocity of hydrogen discharge needed to produce visible gas bubbles. He finds that an excess over the theoretical potential difference (obtained from an oxidation cell) is required, just as in the discharge of hydrogen, and that this excess depends on the nature of the metal used. In 0.01*N* solutions of sodium hydroxide, potassium iodate and bromate are much reduced before hydrogen begins to be evolved on platinum cathodes, and in the case of the iodate, reduction takes place more readily with platinised than with smooth platinum cathodes. With potassium nitrate, reduction and evolution of hydrogen begin almost simultaneously, whilst with sodium chlorate, hydrogen is evolved first, and therefore no reduction takes place. With cathodes of iron,

mercury, and zinc, the reduction of potassium nitrate begins before the evolution of hydrogen. This was confirmed by electrolysis of normal solutions of potassium nitrate on a larger scale, when it was found that about 15 per cent. of the cathodic hydrogen was used in reduction with a platinised platinum cathode, 76 per cent. with smooth platinum, 97.5 per cent. with iron, and 97 per cent. with zinc. The E.M.F. required for reduction at an iron cathode is, however, about 0.3 volt less than at a zinc cathode. Very similar results were obtained with potassium nitrite, which is, however, less readily reduced than the nitrate at a platinum cathode, and more readily at cathodes of iron and zinc. Copper and mercury gave results similar to iron and zinc respectively. Hydroxylamine and hydrazine are much more readily reduced than either nitrate or nitrite; they cannot therefore be formed as intermediate products of the reduction.

Anomalous results were obtained with sodium chlorate. When a gradually increasing E.M.F. is applied to a neutral solution of this salt, a sensible current passes before hydrogen begins to be evolved only when the cathode is of iron or cobalt; with other metals (platinum, gold, silver, copper, nickel, tin, zinc, lead, and cadmium) the passage of the current corresponds with the liberation of hydrogen. Sodium chlorate should therefore be reduced at cathodes of iron and cobalt. As a matter of fact, it is only reduced at a cathode of iron. Further, the evolution of hydrogen from cathodes of zinc and mercury requires a higher E.M.F. than from iron; the author supposes that the fact that no reduction takes place with these metals must be due to some special catalytic action of iron. According to the theory of oxidation cells, a substance should be the more readily reduced the smaller the concentration of the OH ions in the solution; this holds for potassium iodate, which is much more reducible in acid than in alkaline solution.

Reduction in general takes place more readily at a rough than at a smooth surface.

Reduction may be retarded or prevented by the formation of a deposit on the cathode which acts as a diaphragm. The behaviour of potassium chromate is fully considered in this connection (see preceding abstract).

T. E.

Dielectric Constant of some Gases and Vapours and its Dependence on Temperature. By KARL BÄDEKER (*Zeit. physikal. Chem.*, 1901, 36, 305—335).—The dielectric constants were determined in a manner essentially similar to that employed by Nernst (*Abstr.*, 1894, ii, 437) and Philip (*Abstr.*, 1898, ii, 9), the values being obtained by comparison with air or hydrogen. The following gases were examined, carbon disulphide from 85—129°; sulphur dioxide, 10.3—103.3°; ammonia, 18.4—108.4°; water, 140—148.6°; hydrogen chloride, 84—106°; methyl alcohol, 93.2—149.5°; ethyl alcohol, 112.4—144.8°, and nitrogen peroxide, 42.5—92.1°. The validity of the Clausius-Mossotti formula, $(k - 1)/(k - 2)d = \text{constant}$, was examined, and it was found that in general the formula does not hold, and that also the Maxwell relation, $k = \mu^2$, is not valid, whilst the departure from the Clausius law is such that at high temperatures the dielectric constant approximates to the square of the refractive index.

L. M. J.

Conductivity produced in Gases by the Motion of Negatively charged Ions. By JOHN S. TOWNSEND (*Phil. Mag.*, 1901, [vi], 1, 198—227).—Plates of aluminium and brass at different potentials were exposed to the influence of Röntgen rays, and the current produced was measured under various conditions of pressure, potential difference, &c. The pressure varied from 4·13 mm. to 0·171 mm., and each set of experiments was made with distances between the plates of 0·5, 1, and 2 centimetres. Curves are drawn for current against potential difference per centimetre, and these show that the current at first varies but slightly with potential difference, but for higher values of the latter it increases very rapidly, and that the curves are steeper the greater the distance between the plates. These results are completely explained, quantitatively as well as qualitatively, by the theory developed by the author, which assigns the conductivity to the negative ions, these, in their motion between the plates, producing by collision other ions. It is shown that the negative ions must be far smaller than the ordinary molecules or the positive ions, and their velocity of agitation is far greater than that of air molecules. Incidentally, it is estimated that the energy required to ionise a molecule is about 10^{-11} ergs. It is also shown that the experiments of Stoletoff (*J. Phys.*, [ii], 9), are also in accord with those of the author and with the theoretical assumptions, which are further in agreement with the conclusions derived from the diffusion of the ions (this vol., ii, 3).

L. M. J.

Electrical Conductivity of Solutions of the Alkali Iodates, and a Formula for the Calculation of the Conductivity. By FRIEDRICH KOHLRAUSCH (*Sitzungsber. Akad. Wiss. Berlin*, 1900, 1002—1008. Compare Kohlrausch and Maltby, *Abstr.*, 1900, ii, 61; this vol., ii, 82).—The exact conductivity determinations previously made for the chlorides and nitrates of potassium, sodium, and lithium have been supplemented by similar determinations for the iodates of the same metals at 18°. The results are contained in the following table:

<i>m.</i>	KIO ₃ .	NaIO ₃ .	LiIO ₃ .
0·0001	97·64	76·69	66·66
0·0002	97·34	76·44	66·43
0·0005	96·72	75·83	65·87
0·001	96·04	75·19	65·27
0·002	95·04	74·30	64·43
0·005	93·19	72·62	62·89
0·01	91·24	70·86	61·23
0·02	88·64	68·56	59·05
0·05	84·06	64·43	55·26
0·1	79·67	60·46	51·50
0·2	74·34	55·45	46·88

To express the alteration of the conductivity with the dilution, the author advocates the equation $(\lambda_{\infty} - \lambda)/\lambda^p = c.m^{\frac{1}{2}}$, where λ is the conductivity at the equivalent concentration m , c is a constant, and p is an exponent which varies from salt to salt (compare the formulæ of Rudolphi, *Abstr.*, 1895, ii, 490; and van't Hoff, *Abstr.*, 1896, ii, 145). When tested by the experimental results recorded in this and the earlier paper, the author's formula is found satisfactory up to $m = 0·1$.

The values finally adopted for the ionic conductivities at infinite dilution are as follows :

K.	Na.	Li.	Cl.	NO ₃ .	IO ₃ .
64.67	43.55	33.44	65.44	61.78	33.87.

J. C. P.

The Amperemanometer. By ANDRÉ JOB (*Zeit. Elektrochem.*, 1901, 7, 421—423).—The instrument is similar to that described by Bredig and Hahn (*ibid.*, 259. See also this vol., ii, 83). It consists essentially of an ordinary voltameter; the mixture of hydrogen and oxygen evolved is, however, not collected, but is allowed to escape through a capillary tube. The pressure thus produced in the apparatus, which is nearly proportional to the volume of gas escaping in unit time, and therefore to the current, is measured on a manometer which is graduated in amperes. Spiriting and frothing are prevented by a layer of petroleum on the surface of the liquid, and the temperature correction is made by slipping a platinum wire into the capillary tube to a depth which is marked on the tube for each temperature.

T. E.

Thermoelectric Behaviour of some Oxides and Metallic Sulphides. By EDMUND VAN AUBEL (*Ann. Phys.*, 1901, [iv], 4, 416—419).—In a recent paper (*Ann. Phys.*, 1900, [iv], 2, 266), Abt arranged a number of metallic oxides and sulphides in the order of their thermoelectric efficiency, and drew the conclusion that the members of this series followed the thermoelectric summation law which holds for metals. The author takes several sets of numbers given by Abt, and shows that the latter's conclusion is not justified by his experimental data.

J. C. P.

Electro-affinity of the Metals. By HARRY M. DAWSON and JOHN McCRAE (*Zeit. anorg. Chem.*, 1901, 26, 94—103).—Abegg and Bodländer (Abstr., 1899, ii, 542) have pointed out that weak ions (atoms or groups of atoms which possess but little affinity for an electron) are those which most readily combine with an electrically neutral molecule to form a complex ion. The authors refer to their experiments on the complex ammonia compounds of copper, nickel, cadmium, and zinc, which show that the ions of these metals combine equally readily with 4 mols. of ammonia. Since the E.M.F.'s required to separate the ions of the above-mentioned metals from their charges are respectively -0.34 , $+0.23$, $+0.38$, and $+0.74$ volt, they should, according to Abegg and Bodländer, possess very different tendencies to combine with ammonia. Furthermore, the results so far obtained by the authors with the alkali metals are not in accordance with Abegg and Bodländer's generalisation. Experiments on the partition of ammonia between chloroform and solutions of silver chloride in ammonia show that the latter contain the compound $2\text{AgCl}\cdot 3\text{NH}_3$.

T. E.

Reactions of Cobalt and Iron, and the Influence of Alcohols and other Organic Substances on the Electrolytic Dissociation of Salts in Aqueous Solution. By HUGO DIRZ (*Chem. Zeit.*, 1901, 25, 109—112).—When a solution of a cobalt salt

is mixed with half its volume of glycerol, and a few drops of ammonia are introduced above the mixture, the ammoniacal layer is coloured an intense yellow. Since nickel does not interfere, even when present in considerable quantity, the reaction is a useful test for cobalt.

The addition of glycerol to a solution of ferric chloride produces a marked intensification of the colour; this effect (which is produced also by ethyl and methyl alcohols) is attributed to the diminished dissociation caused by the introduction of a substance with lower dielectric constant. In this connection, the author discusses Grassini's experiments (this vol., ii, 43); according to Grassini, the blue colour produced at the contact surface of alcohol and a mixture of cobalt chloride and potassium thiocyanate solutions is destroyed by hydrogen peroxide; the author shows that the colour is destroyed by the same volume of pure water, and explains the phenomena on dissociation lines. When an extremely dilute solution of cobalt sulphate is mixed with potassium thiocyanate and alcohol, no blue colour is observed unless a few cubic centimetres of ether are added, the ether presumably favouring the formation of the undissociated compound to which the blue colour is due. Acetone is quite as effective as a mixture of alcohol and ether. This delicate reaction may be used to detect cobalt in presence both of nickel and iron.

The part played by dissociation in these colour reactions is further illustrated by the discharge of the blue colour of alcoholic cobalt chloride solutions on the addition of water. J. C. P.

Depression of the Freezing Point in Aqueous Solutions of Electrolytes. By JAMES G. MACGREGOR (*Trans. Roy. Soc. Canada*, 1900, [ii], 6, Sect. III, 3—19. Compare this vol., ii, 8).—The value of many physical properties of dilute solutions of electrolytes may be expressed thus: $P = P_w + k(1 - \alpha)n + l\alpha n$, where P and P_w are the values of the property for the solution and for water respectively, n is the concentration, α is the ionisation coefficient, and k and l are constants. The author shows that the expression can be applied to the case of the freezing point, and that this knowledge may be used in obtaining approximate values for the depression of the freezing point per gram mol. by the undissociated, and per gram ion by the free ions. When δ represents the equivalent depression of the freezing point, the above equation becomes: $\delta = k + (l - k)\alpha$; if therefore the expression is applicable, the curve obtained by plotting equivalent depression against ionisation coefficient should at sufficient dilution become practically a straight line. Using the experimental data of Archibald (*Abstr.*, 1900, ii, 65), and Barnes (*Abstr.*, 1900, ii, 526), the author finds that for the more dilute solutions the differences between calculated and observed values are within the limit of experimental error. The above expression may also be extended to calculate the depression in solutions of more than one electrolyte. J. C. P.

A Proposal regarding the Definition of Thermal Capacity. By THEODORE W. RICHARDS (*Zeit. physikal. Chem.*, 1901, 36, 358—360).—A plea for a change in the calorie which would give a simpler connection with the erg. The suggestion is that the thermal unit

should be 10^7 ergs or 1 Joule, this being about $1/4.2$ of the present value.

L. M. J.

Development of the Thermodynamical Potential in Terms of T and p in the Case of Compound Components. By J. J. VAN LAAR (*Zeit. physikal. Chem.*, 1901, 36, 216—224).—A mathematical paper not suitable for abstraction.

J. McC.

The Specific Heat of Solutions. By KARL PUSCHL (*Monatsh.*, 1901, 22, 77—87).—The specific heat of aqueous solutions of electrolytes has always a smaller value than would be the case if the water and the solute respectively exhibited the specific heats they possess in the free state. With increased dilution, this deviation increases until in some cases, if the specific heat of the water = 1, that of the solute becomes a negative quantity. The author suggests that the specific heat of the water in the solution has not its normal value, but that some part of the water (the "hydrate water") has the specific heat 0.5, that is, the specific heat of ice. Thus the specific heat of a solution of potassium hydroxide of the composition $(\text{KHO} + 30\text{H}_2\text{O})$ requires that $4\text{H}_2\text{O}$ should have this reduced specific heat, and the conclusion is drawn, therefore, that the hydrate, $\text{KHO}, 4\text{H}_2\text{O}$, is present. As the dilution increases, the quantity of "hydrate water" increases, but in the case of sodium hydroxide reaches a maximum, and then decreases.

K. J. P. O.

Specific Heat and Latent Heat of Fusion of Ethylene Glycol. By ROBERT DE FORCRAND (*Compt. rend.*, 1901, 132, 569—571. Compare Abstr., 1900, ii, 527).—In a former communication, the author assumed that the molecular heat of ethylene glycol is 2.66 Cal. This assumption has now been verified by direct experiment on a sample of the compound melting at -11.5° . The specific heat of liquid glycol, determined for the following ranges of temperature, $139-13^\circ$, $59.6-13^\circ$, $9- -22.8^\circ$, was 0.6268, 0.5848, and 0.5365 respectively; in the last case, the compound was in a state of superfusion. These results correspond closely with the values calculated from the equation $Q = 0.54453t + 0.0005675t^2$, showing that the law of variation of the specific heat is not modified by the superfusion. The above data were employed in determining the latent heat of fusion of the compound, the specific heat of solid glycol being assumed to be 0.265 at temperatures near the melting point. The mean molecular heat of fusion of glycol as experimentally determined is 2.683 Cal.

G. T. M.

Vapour Pressure of Ternary Mixtures. By FRANZ A. H. SCHREINEMAKERS (*Zeit. physikal. Chem.*, 1901, 36, 257—289).—A more extended and fuller treatment of the author's previous paper on the same subject (this vol., ii, 146).

L. M. J.

Thermochemical Study of the Ammonio-aluminium Chlorides. By E. BAUD (*Compt. rend.*, 1901, 132, 553—556. Compare this vol., ii, 161).—The ammonio-aluminium chlorides are stable in a dry atmosphere, the salt containing 18 mols. of ammonia, decomposing, however, at temperatures above 0° ; they are all decomposed by water; the compound, $\text{Al}_2\text{Cl}_6, 12\text{NH}_3$, has the following

thermochemical constants: heat of dissolution, 12.70 cal., and heat of formation, 268.23 cal., the heat evolved for each addition of 1 mol. ammonia being 22.35 cal.

The heats of dissolution and formation of the compound $\text{Al}_2\text{Cl}_6 \cdot 10\text{NH}_3$ are 18.10 and 245.23 cal. respectively, the heat generated in converting this substance into the preceding salt being 23.00 cal. The heats of dissolution and formation of the diammonio-salt are 97.45 and 82.28 cal. respectively, the conversion of this substance into the decammonio-salt being attended by a generation of 162.95 cal. The temperatures of decomposition of the di-, deca-, and duodeca-salts as calculated from thermochemical data are 1013° , 363.6° , and 86.4° respectively; it is found experimentally that the decammonio-compound decomposes at 380° under atmospheric pressure, whereas the diammonio-salt distils without decomposition at 480° .

The heat of fixation of 1 mol. of water (gaseous) in the hydrate, $\text{Al}_2\text{Cl}_6 \cdot 12\text{H}_2\text{O}$, is 22.25 cal., a value corresponding with that determined for 1 mol. of ammonia in the case of the ammonio-analogue, $\text{Al}_2\text{Cl}_6 \cdot 12\text{NH}_3$.

G. T. M.

Alteration of Free Energy during the Formation of some Slightly Soluble Metallic Salts. By ARTHUR KLEIN (*Zeit. physikal. Chem.*, 1901, 36, 361—371).—The heat developed in certain reactions was calculated from determinations of the E.M.F. and its temperature coefficient (see Czepinski, Abstr., 1899, ii, 267). The following results were obtained: $\text{PbCl}_2 + 2\text{KBr(aq)} = \text{PbBr}_2 + 2\text{KCl(aq)}$, +3560 cal.; $\text{PbBr}_2 + 2\text{KI(aq)} = \text{PbI}_2 + 2\text{KBr(aq)}$, +5770 cal.; $\text{PbCl}_2 + 2\text{KI(aq)} = \text{PbI}_2 + 2\text{KCl(aq)}$, +9330 cal.; $\text{PbCl}_2 + \text{K}_2\text{SO}_4\text{(aq)} = \text{PbSO}_4 + 2\text{KCl(aq)}$, -2480 cal.; $\text{PbBr}_2 + \text{K}_2\text{SO}_4\text{(aq)} = \text{PbSO}_4 + 2\text{KBr(aq)}$, -6040 cal.; $\text{PbI}_2 + \text{K}_2\text{SO}_4\text{(aq)} = \text{PbSO}_4 + 2\text{KI(aq)}$, -11810 cal.; $\text{CuBr} + \text{KI(aq)} = \text{CuI} + \text{KBr(aq)}$, +6495 cal.; $\text{AgCl} + \text{KBr(aq)} = \text{AgBr} + \text{KCl(aq)}$, +4260 cal.; $\text{AgBr} + \text{KI(aq)} = \text{AgI} + \text{KBr(aq)}$, +6310 cal.; $\text{AgCl} + \text{KI(aq)} = \text{AgI} + \text{KCl(aq)}$, +10570 cal. Of these reactions, that between lead iodide and potassium sulphate proceeds in the reverse direction at temperatures below 8° , so that the reaction is endothermic or exothermic according to temperature.

L. M. J.

Heat of Combustion of Glucosides. By EMIL FISCHER and WOLF VON LOEBEN (*Sitzungsber. Akad. Wiss. Berlin*, 1901, 323—326).

	Molecular heat of combustion.		Molecular heat of formation.
	Constant volume.	Constant pressure.	
α -Methylglucoside	846.4 Cal.	846.7 Cal.	296.5 Cal.
β -Methylglucoside	844.9	845.2	298.0
α -Methylgalactoside	839.4	839.7	303.5
α -Methylmannoside	842.6	842.9	300.3
Salicin	1523.0	1523.6	323.4
Helicin	1480.5	1480.8	297.2
Triacetone-mannitol ...	2003.0	2005.0	306.6

The heat of formation of salicin from dextrose and saligenin is

-0.4 Cal., whilst that of helicin from dextrose and salicylaldehyde is +4.0 Cal. The heat of formation of triacetonemannitol from its generators is 4.2 Cal. G. T. M.

Thermochemistry of *o*-Chlorobenzoic Acid. By GUSTAVE MASSOL (*Bull. Soc. Chim.*, 1901, [iii], 25, 195—196).—The heat of dissolution of *o*-chlorobenzoic acid is 6.2 Cal., and its heat of neutralisation by sodium hydroxide 15.96 Cal., the latter being greater by 2.26 Cal. than is the case with benzoic acid. The heat of dissolution of the anhydrous sodium salt is 2.1 Cal., whilst its heat of formation is 18.87 Cal., all the substances concerned being in the solid state. The heat of formation of sodium benzoate is 17.4 Cal.; hence the introduction of a chlorine atom in the ortho-position increases the heat of combination of benzoic acid by 1.47 Cal. N. L.

Thermochemistry of *o*-Iodobenzoic Acid. By GUSTAVE MASSOL (*Bull. Soc. Chim.*, 1901, [iii], 25, 196).—The solubility of *o*-iodobenzoic acid in water is too small to allow of its heat of dissolution being directly determined. Its heat of dissolution in sodium hydroxide solution is 9.48 Cal. The heat of dissolution of the anhydrous sodium salt is 2.96 Cal., and its heat of formation from the solid base and acid is 17.73 Cal. The latter is only 0.33 Cal. greater than the corresponding value for sodium benzoate (see preceding abstract). N. L.

Molecular Heats of Compounds and the Law of Neumann-Joule-Kopp. By EDMUND VAN AUBEL (*Ann. Phys.*, 1901, [iv], 4, 420—421).—Certain compounds are quoted as exceptions to Meyer's generalisation (*Abstr.*, 1900, ii, 464). Thus in the case of silver bromide and potassium iodide the molecular volume is less than the sum of the atomic volumes, whilst the molecular heat is greater than the sum of the atomic heats. For mercurous and mercuric iodides, the molecular volume is greater than the sum of the atomic volumes, whilst the molecular heat is less than the sum of the atomic heats. The exceptional behaviour of iron-antimony alloys is also referred to. J. C. P.

Heats of Solution, especially that of $\text{CdSO}_4 \cdot 8/3\text{H}_2\text{O}$. By H. B. HOLSBØER (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 3, 467—469).—If the solubility of a compound increases with temperature, the theoretical heat of solution, that is, the heat of solution in a saturated solution, must be negative, and *vice versa*. Cadmium sulphate, $\text{CdSO}_4 \cdot 8/3\text{H}_2\text{O}$, has a minimum of solubility at 15°, and the theoretical heat of solution should therefore be zero at this temperature; the following values were obtained from experimental determinations: 5°, +219 cal.; 10°, +165 cal.; 15°, +3 cal.; 20°, -620 cal.; 25°, -1221 cal. If the thermal capacity of a solution is equal to the sum of the thermal capacities of the constituents, the heat of solution should be independent of temperature, and it was found that, at the concentration $\text{CdSO}_4 + 22.5\text{H}_2\text{O}$,

the curves for the various temperatures all cut, a peculiarity which probably occurs with many other substances. L. M. J.

Liquefaction of a Mixture of Two Gases. Composition of the Liquid and of the Vapour. By PIERRE DUHEM (*J. Physical Chem.*, 1901, 5, 91—112. Compare Abstr., 1897, ii, 364).—The author discusses the effect of pressure on a mixture of two liquefiable gases at various temperatures, and shows that above a certain temperature, which depends on the composition of the mixture, the mass remains homogeneous, whatever be the pressure. There exist also limiting pressures for lower temperatures between which the mixture is in part liquid and in part vapour, but above and below which it is homogeneous. At these intermediate pressures, two cases may occur, (a) when there is *retrograde condensation*, and (b) when there is *retrograde vaporisation*. In the former case, when a certain pressure is reached, a drop of liquid is formed and this at first increases with the pressure and its mass rises to a maximum, but further increase of pressure causes it to diminish and ultimately disappear. In the second case, when pressure is applied to a homogeneous liquid mixture at a certain pressure, a bubble of vapour appears and the mass of this increases up to a maximum, then diminishes, and finally disappears.

These cases are fully discussed with relation to the Gibbs-Konowaloff point, the temperature, and the composition of the mixture in the gaseous and liquid phases. Curves are given showing the variation of the concentration in the two phases at various temperatures with increasing pressure. J. McC.

Compressibility of Solutions. By JOSEPH GUINCHANT (*Compt. rend.*, 1901, 132, 469—472).—Experiments with aqueous solutions of alcohol, acetic acid, isobutyl alcohol, acetone, sucrose, resorcinol, and carbamide show that up to a pressure of 4 atmos. the volume of the dissolved substance is independent of the pressure. It follows that the variation in volume which accompanies the simple dissolution of a substance in water must be attributed to a change in the state of aggregation of the solvent rather than to the volume occupied by the dissolved molecules. C. H. B.

Relative Bulk of Weak Aqueous Solutions of Certain Sulphates and their Constituent Water. By CHARLES M. PASEA (*Trans. Roy. Soc. Canada*, 1900, [ii], 6, Sect. III., 27—36).—Macgregor has shown that in the case of weak aqueous solutions of certain sulphates, the solutions have a smaller volume than the water which they contain would have in the free state. Continuing this investigation, the author has determined the specific gravity of dilute solutions of sodium, manganese, cadmium, and ferrous sulphates; contraction has been found in the last three cases, but only at certain concentrations. Summarising all results obtained by himself and other observers, the author points out that solutions of cadmium, cobalt, copper, ferrous, magnesium, nickel, and zinc sulphates exhibit contraction. No contraction has been observed in the case of ammonium, ammonium-aluminium, ammonium-iron, ammonium-sodium, beryllium, ferric, hydrogen-potassium, lithium, magnesium-potassium, potassium, potass-

ium-aluminium, sodium, and potassium-iron sulphates. It is noted that in the former of the two lists, every metal is bivalent. J. C. P.

Deductions from Capillary Phenomena. By ALBERT EINSTEIN (*Ann. Phys.*, 1901, [iv], 4, 513—523).—If γ represents the work to be done on a liquid in order to increase the surface by unit area, the author shows that the function $\gamma - T.d\gamma/dT$ is more suited than γ itself for the discovery of additive relationships. He deduces the expression $\Sigma c_a = v. \sqrt{\gamma - T.(d\gamma/dT)}. \sqrt{(1/K')}$, where c_a represents the characteristic number for an atom, v is the molecular volume, and K' is a constant. Taking $c_H = -1.6$, $c_O = 55.0$, $c_C = 46.8$, the values of Σc_a are calculated for a number of organic compounds, and a fair agreement is found with the values of Σc_a obtained from the above equation. J. C. P.

Combustion of Gases. By SIMEON M. TANATAR (*Zeit. physikal. Chem.*, 1901, 36, 225—226. Compare this vol., ii, 13).—When 6 volumes of electrolytic gas are mixed with 1 volume of propylene and the mixture sparked over water for some time, a diminution in volume takes place. This diminution corresponds with the volume of propylene equivalent to the oxygen contained in the mixture, according to the formula $C_3H_6 + 3O_2 = 3CO + 3H_2O$. The hydrogen, therefore, takes no part in the combustion. The mixture can be ignited at a jet and burns with a luminous flame.

When passed through a glass tube heated at one spot to redness, the mixture ignites and the flame travels back a distance depending upon the rate of the gas current. The gas resulting from this combustion contains only carbon monoxide, hydrogen, propylene, and oxygen. The propylene alone takes part in the combustion, and part of the oxygen escapes combination because it has not time to unite with the excess of hydrogen and propylene at the proper temperature. J. McC.

Dependence of Hydrolysis on Temperature. By THORVALD MADSEN (*Zeit. physikal. Chem.*, 1901, 36, 290—304).—The velocity of hydrolysis of ethyl acetate by sodium hydroxide solutions was determined at temperatures of about 10° and 40°. The results for the velocity constant were 10°, 2.24; 39.33°, 13.17; 41.81°, 16.32. From these values, the constant in the Arrhenius formula for the temperature variation is calculated as (1) 5339, (2) 5562, numbers agreeing well with previous determinations. The hydrolysis was also effected by solutions of potassium cyanide, and from the results the hydrolytic decomposition of the latter was calculated; the values obtained are slightly higher than those found by Shields (*Abstr.*, 1893, ii, 448). The sodium salts of sucrose, dextrose, and lævulose were also investigated, and the values of the velocity constants obtained were compared with those found for potassium hydroxide; in all cases, the ratio increases with rise of temperature, and from the ratios the dissociation constant of the sodium compound was obtained. From the temperature coefficients, the heats of formation of the compounds are deduced. The value so obtained for potassium cyanide is 3424 cal., a value consider-

ably higher than that obtained directly. The values for the sodium compounds of the sugars are also far higher than would be expected, varying from 3302 to 6871.
L. M. J.

Relations between Constitution and Reactive Power. By RUDOLF WEGSCHEIDER (*Chem. Centr.*, 1901, i, 356; from *Oesterr. Chem. Zeit.*, 4, 1—7).—The author discusses a law of conservation of linkings, according to which the number of linkings dissolved in any reaction is a minimum. Thus, in the addition of bromine to ethylene, it is probably the compound $\text{CH}_2\text{Br}\cdot\text{CH}_2\text{Br}$ that is formed, because the formation of $\text{CHBr}_2\cdot\text{CH}_3$ would involve the dissolution of a larger number of linkings. The law is in so far subject to exception, as intermolecular changes are possible. The reactive power of a substance is its ability to undergo intermolecular changes with moderate velocity. This velocity depends on the nature of the atoms immediately concerned in the change of distribution of linkings, and also on the constitution of the molecule as a whole. The author points out several types of constitutional influence, although no reaction can be regarded as exemplifying one type alone.
J. C. P.

Determination of the Avidity of Phenol by the Thermochemical Method. By I. S. PLOTNIKOFF (*J. Russ. Phys. Chem. Soc.*, 1901, 33, 51—61).—Using Thomsen's thermochemical method of measuring the heat developed when sodium hydroxide is neutralised by phenol and sulphuric acid together in solution, the author finds the avidity of phenol to have the value 0.0126, which is somewhat greater than that of boric acid.
T. H. P.

Fractional Esterification and Hydrolysis of Stereoisomeres. By WILLY MARKWALD and ALEXANDER MCKENZIE (*Ber.*, 1901, 34, 469—478. Compare *Abstr.*, 1899, ii, 733).—The ratio of the velocities of esterification of *l*- and *d*-mandelic acids with *l*-menthol, calculated by the aid of the formula $c = \log \frac{a-x}{a} / \log \frac{b-y}{b}$ from the data previously given is 0.897. The ratio for the velocities of hydrolysis of the menthyl esters of the *l*- and *d*-acids is 0.910.

Although the *d*-acid is esterified somewhat more quickly than the *l*-acid, yet when the resulting ester obtained from *r*-mandelic acid is hydrolysed, the acid has a slight levorotation. This is now shown to be due to partial racemisation during esterification. Experiments made with phenylethoxyacetic acid (*Trans.*, 1899, 75, 758) have given similar results, but experiments with α -ethoxypropionic acid (*ibid.*, 487) indicate that no racemisation occurs during esterification with *l*-menthol.

The authors find that methyl-*n*-hexylcarbinol obtained from ricinoleic acid has a slight levorotation $\alpha_D - 10'$ ($l=2$), and that it is in reality a mixture of the *d**l*- and *l*-alcohols. When heated at 155° with two-thirds of its weight of *d*-tartaric acid, the *l*-alcohol is somewhat more quickly esterified than the *d*-alcohol; the difference, however, is but slight. When the resulting ester is hydrolysed, the ester of the *l*-alcohol is much more readily decomposed than that of the *d*-alcohol.

It is probable that the alcohol obtained from ricinoleic acid contains a certain amount of heptyl alcohol. J. J. S.

Eutectic Curves in Systems of Three Substances of which Two are Optical Antipodes. By J. H. ADRIANI (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 3, 463—467).—It has been shown that the examination of the freezing point curve of solutions of active compounds furnishes a means of deciding whether an externally compensated inactive substance is a conglomerate, a racemic compound, or a pseudo-racemic mixed crystal. By the use of different solvents of high melting point, it may be further possible to find whether above a certain temperature the racemic compound decomposes into mixed crystals. Experiments with camphoroxime in naphthalene, phenanthrene, and benzoin solutions showed that although a racemic compound exists at the temperature of 97°, yet in anthracene solution at 105·6° the *i*-oxime must be regarded as a mixed crystal of the active compounds, a result in accord with the author's previous investigations (Abstr., 1900, ii, 462; Bruni, Abstr., 1899, ii, 732).

L. M. J.

Two Cases of Catalysis in Non-homogeneous Systems. By KARL DRUCKER (*Zeit. physikal. Chem.*, 1901, 36, 173—215).—I. Anhydrous chromic chloride, obtained by sublimation, is practically insoluble in water, but in presence of reducing agents solution takes place, due to the transformation into the soluble modification.

The author has determined the amount of chromic chloride passing into solution in different times in presence of reducing agents, the reduction-potentials of which are measured in a capillary electrometer. Experiments have been made with Peters' ferrosulfuric mixture, with and without addition of potassium fluoride (Abstr., 1898, ii, 419), ferrous sulphate and sulphuric acid, ferrous oxalate, hydroxylamine sulphate, cuprous chloride, mercurous chloride, and a few other reducing agents. The calculated rates of solution do not give an entirely satisfactory constant value, but the results show that the rate is dependent upon (1) the nature of the reducing agent, (2) its reduction-potential, increasing and decreasing with this, and (3) its absolute concentration. In presence of a sparingly soluble reducing agent, solution of the chromic chloride only takes place provided that the agent is also present in the solid state. The author believes that the function of the reducing agent is not entirely catalytic, but that reaction takes place between this and the chromic chloride. Solution is probably preceded by a slight reduction to chromous chloride, the catalytic influence of which is very great; only a small quantity of this can, however, be formed, since its potential in solutions of appreciable concentration is greater than that of hydrogen, whilst the potential in the solution cannot rise above that of the reducing agent present. It has not been proved that the catalytic influence is wholly due to chromous chloride. Loewel's hypothesis (*J. Pharm.*, 1843, [iii], 4, 424) is discussed and shown to be insufficient, as also is Recoura's interpretation of it (Abstr., 1886, 669).

II. The rate of solution of arsenious oxide in presence of sulphuric acid, acetic acid, oxalic acid, some alkali salts, ethyl or amyl alcohols,

or mannitol has been determined. A constant value, in agreement with the researches of Noyes and Whitney (Abstr., 1897, ii, 479), has been obtained in each set of experiments for the rate of solution. Amyl alcohol slightly decreases the rate, but all the other substances increase it. Hydrogen ions exert a strong catalytic action—sulphuric acid having a much greater influence than acetic acid on account of the greater degree of dissociation. The hydroxyl ion is a stronger catalyser than the hydrogen ion. The solubility of arsenious oxide in these various solvents is not appreciably different from that in pure water.

J. McC.

The Standard of Atomic Weights. By BOHUSLAV BRAUNER (*Zeit. anorg. Chem.*, 1901, 26, 186—202).—A reply to certain objections to the standard $O=16$, which have been raised from the pedagogic standpoint.

T. E.

So-called Liquid Crystals. By GUSTAV TAMMANN (*Ann. Phys.*, 1901, [iv], 4, 524—530. Compare Schenck, Abstr., 1898, ii, 286, 563; 1899, ii, 360; Schenck and Schneider, Abstr., 1899, ii, 637; Abegg and Seitz, Abstr., 1899, ii, 623).—It is possible to regard the turbid liquids obtained on melting clear crystals of *p*-azoxyanisole or *p*-azoxyphenetole as emulsions of a brown reduction product in the fused compounds; the clear crystals may be regarded as solutions of the brown reduction product in the crystals of these compounds. The author holds that so-called crystalline liquids have not been definitely proved to exhibit characteristic double refraction. The temperature at which turbidity disappears is lowered by the addition of other substances (Schenck and Schneider, *loc. cit.*), a phenomenon which may be attributed simply to an increased solubility of the reduction product in presence of other substances. If the so-called liquid crystals are really mechanical mixtures of two liquids, it must be possible to separate them, to raise the melting point of the solid crystals, and to lower the temperature at which turbidity disappears. By repeated distillation in a current of superheated steam, the temperature at which turbidity disappears in the case of *p*-azoxyanisole was lowered 6.5° ; the experiments, however, are not yet completed. Cholesteryl benzoate, which Lehmann regards as giving a crystalline liquid on melting, is unsuited for investigation because of its doubtful chemical homogeneity.

J. C. P.

Physical Properties of Albuminous Micelles. By SWIGEL POSTERNAK (*Ann. Inst. Pasteur*, 1901, 15, 85—120).—A "micelle" is used to denote the smallest quantity of a colloid which possesses all the physical properties of the colloid and is formed by the association of molecules of large size. The paper does not lend itself to abstraction. The precipitation of colloidal substances by solutions of chemical reagents depends on the concentration of the ions of the latter.

R. H. P.

Devices for Circulating Liquids at Constant Temperature. By IRA H. DERBY (*J. Physical Chem.*, 1901, 5, 17—20).—The apparatus described is stated to realise the following conditions. Rapidity of circulation, ease of construction, economy, rapidity of

adjustment, constancy of temperature, great range of temperature. Into a large thermostat the ends of the circulating tubes dip, and are filled by suction. The reflux tube is encircled by a loosely fitting tube ending in a bulb, in which two side holes of about 1 cm. diameter are blown. This tube is rapidly rotated by a suitable motor, and in consequence of the centrifugal force, the water is driven out through the side holes and drawn through the tubes, whilst further, this scattering of the return water through the bath obviates the necessity for an independent stirrer.

L. M. J.

Inorganic Chemistry.

Inorganic Chemistry and Physical Chemistry. By CLEMENS WINKLER (*Ber.*, 1901, 34, 393—399).—A plea for the more efficient study of inorganic chemistry as distinct from physical chemistry, particularly with reference to its employment in the development of the new electrochemical industries.

G. T. M.

Combustible Gases of the Atmosphere : Atmospheric Hydrogen. By ARMAND GAUTIER (*Ann. Chim. Phys.*, 1901, [iii], 22, 5—110).—A detailed account of work already published, containing also a discussion as to the origin of atmospheric hydrogen not suitable for abstraction (compare *Abstr.*, 1898, ii, 535, 537, 640, 641 ; 1899, ii, 149 ; 1900, ii, 469, 537, 538, 720 ; and this vol., ii, 14, 92, and 171).

G. T. M.

Explosion of Mixtures of Combustible Vapours or Fumes and Air. By K. KUBIERSCHKY (*Zeit. angew. Chem.*, 1901, 14, 129—132).—The following percentages show the least amount of vapour which will explode with 100 volumes of air: benzene, 1.4 ; toluene, 1.4 ; ethyl alcohol, 4.0 ; methyl alcohol, 7.8 ; acetone, 2.7 ; ethyl ether, 1.8 ; carbon disulphide, 4.1. The gases resulting from the combustion of alcohol have a higher specific heat than those from benzene and similar hydrocarbons, so that the latter are better for use with explosion motors. Carbon disulphide readily explodes with air ; when the carbon disulphide is in excess, sulphur separates, and when the air is in excess, sulphur trioxide is formed. A mixture of 2 parts of benzene with 3 parts of carbon tetrachloride will not explode with air, but burns quietly with a very luminous flame. For the preparation of these explosive mixtures, it is not necessary that the combustible substance should be vaporised, since air, in which the combustible substance is suspended as a mist or fumes, behaves in the same manner as a mixture of air and the vaporised substance.

R. H. P.

Method for Determining the Molecular Weight of Ozone. By ALBERT LADENBURG (*Ber.*, 1901, 34, 631—635).—The molecular

weight of ozone was determined by weighing a bulb first when filled with oxygen, and then when filled with a quantity of the same sample of oxygen ozonised to the extent of 4 to 8 per cent. ; the increase in weight gave the weight of active oxygen, and the total volume of ozone was determined by absorption with turpentine. The mean of five determinations of the molecular weight was 47.78, the extreme values being 45.3 and 50.4.

T. M. L.

Sulphuryl Fluoride. A New Gas. By HENRI MOISSAN and PIERRE LEREAU (*Compt. rend.*, 1901, 132, 374—381. Compare Abstr., 1900, ii, 341, 472).—*Sulphuryl fluoride*, SO_2F_2 , is prepared by passing fluorine into an apparatus containing sulphur dioxide so disposed that the former gas as it reaches the latter is strongly heated by means of a platinum wire placed at the inner end of the inlet tube and rendered incandescent by an electric current. Without this device, the combination of the gases is delayed, and then subsequently takes place with explosive violence. The new gas may also be obtained by passing fluorine into moist hydrogen sulphide, when the former burns quietly with a blue flame; the product also contains silicon fluoride, sulphur hexafluoride, and thionyl fluoride; when the experiment is performed in glass vessels, the presence of moisture is not essential, the necessary oxygen being derived from the action of the hydrogen fluoride produced on the silica. The sulphuryl fluoride, freed from the other products by washing with water and with copper sulphate solution, is dried over fused potassium fluoride, liquefied, and fractionated in a vacuum.

The compound is a colourless, odourless gas boiling at -52° and melting at -120° , its vapour pressures at -120° and -80° being 65 and 241 mm. respectively. It is stable at temperatures below a dull red heat, but when strongly heated in glass vessels it interacts with the silica, yielding silicon fluoride, sulphur trioxide, and small quantities of sulphur dioxide. Sulphuryl fluoride is insoluble in concentrated sulphuric acid, but 1 part of the gas dissolves in 10 parts of water at 9° , whilst alcohol absorbs three times its volume of the compound at the same temperature; it is slowly absorbed by aqueous solutions of potassium, calcium, or barium hydroxides, and is rapidly dissolved by alcoholic solutions of the alkali hydroxides. Fluorine is without action on the gas even at 200° , and oxygen produces but a slight decomposition even by the aid of the electric spark; hydrogen at red heat furnishes a white, solid substance yielding sulphuric and hydrofluoric acids on treatment with water. Sulphur and selenium readily decompose the gas at a red heat with the formation of silicon fluoride and their respective lower oxides; phosphorus, arsenic, carbon, and boron, on the other hand, have no action on the compound; silicon produces a slight decomposition, but the reaction is not complete even after 1 hour.

Iron and magnesium do not interact with the gas even at a red heat, sodium and calcium, however, completely absorb it, forming the corresponding sulphides and fluorides, the reaction with sodium being employed in the analysis of the compound.

A mixture of hydrogen sulphide and the new fluoride, when heated

to a dull red heat, yields a deposit of sulphur, but no change occurs when the fluoride is heated with hydrogen chloride.

A white solid compound, $\text{SO}_2\text{F}_2 \cdot 5\text{NH}_3$, soluble in water, is produced by the direct union of its generators at the ordinary temperature.

G. T. M.

Preparation and Properties of Sulphammonium. By HENRI MOISSAN (*Compt. rend.*, 1901, 132, 510—518. Compare Abstr., 1899, ii, 152).—The octahedral, prismatic, and insoluble modifications of sulphur are not affected by dry liquid ammonia at -80° , but dissolve yielding purple solutions when the temperature rises to -38° , -15.5° , and -11.5° respectively. The solutions thus obtained seem to contain the sulphur in a state of combination, for they solidify at temperatures 4° or 5° below the melting point of solid ammonia without depositing any of the element. Moreover, quantitative experiments indicate that sulphur is quite insoluble in liquid ammonia at temperatures below that at which the purple coloration is developed. The name *sulphammonium* is given to the substance whose existence is thus indicated; the product, however, appears to vary considerably in composition, at -28° corresponding with the formula $\text{S}(\text{NH}_3)_2 \cdot 2\text{NH}_3$, and at $0-20^\circ$ with $\text{S}(\text{NH}_3)_2 \cdot \text{NH}_3$. Sulphammonium is stable at comparatively high temperatures, its solution, when heated in sealed tubes from -11.5° to 90° , being intensely coloured; at higher temperatures, however, the colour fades, and entirely disappears at 131° , the critical temperature of ammonia. The globules of melted sulphur now noticed on the sides of the tubes remain undissolved until the temperature of the ammonia falls to 100° ; at this point, the coloration reappears and increases in intensity as the temperature falls.

In sealed tubes at 20° , the sulphammonium is partially dissociated, equilibrium being attained when the solution contains 30 per cent. of sulphur; when the pressure is released, the soluble product is completely decomposed with the deposition of sulphur. The coloration developed by adding sulphur to liquid ammonia maintained at -35° under the ordinary pressure is very faint, the dissociation of the sulphammonium, under these conditions, being almost complete. In sealed tubes, on the other hand, the amount of sulphur dissolved in a given quantity of ammonia increases as the temperature diminishes, and well-defined sulphur crystals may be produced by slowly raising to 20° the temperature of solutions prepared at -40° .

Red, fern-like leaflets of the solid sulphammonium are produced by submitting a mixture of nitrogen and ammonia at -12° to a pressure of 45 atmospheres in the presence of sulphur. Sulphammonium has a very characteristic absorption spectrum, this property serving as a means of detecting small quantities of sulphur. An ammonia solution containing 0.0061 per cent. of sulphur has a distinctly red colour, and gives an absorption spectrum containing two bands, one cutting off the orange and yellow parts of the spectrum, the other the whole of the blue rays with portions of the green and violet. A more concentrated solution cuts off all the light except a green band and the least refrangible portion of the red end of the spectrum. Sulphammonium dissolves in absolute alcohol and ether, in the latter case yielding at

-80° a purple solution turning blue on dilution; at -40°, however, the product is decomposed, with liberation of sulphur. Liquids miscible with ammonia lower its vapour pressure, and consequently increase the dissociation of sulphammonium; this substance yields, with benzene and carbon disulphide, brown and blue solutions respectively, whilst carbon tetrachloride yields colourless crystals and an orange compound dissociating under the ordinary pressure. Sulphammonium interacts with many substances, yielding sulphur derivatives; with iodine, it furnishes a compound of ammonia and sulphur iodide, and with calcium-ammonia either white calcium monosulphide or the corresponding red persulphide, depending on the proportions of the reagents. Mercuric, lead, and manganese chlorides and the oxides of zinc and calcium interact with sulphammonium, giving rise to unstable products; mercury also is attacked, with the formation of the black sulphide, whilst selenium and the alkali haloid salts are not affected. G. T. M.

Replacements in the Sulphur-Selenium-Tellurium Group.
By FRIEDRICH KRAFFT and O. STEINER (*Ber.*, 1901, 34, 560—565).—When phenyl selenide, SePh_2 , is heated nearly to the boiling point with sulphur, diphenyl sulphide is produced and selenium liberated, the reaction being practically quantitative at 300°. Phenyl telluride undergoes a similar change when heated with sulphur, tellurium and phenyl sulphide being formed. Phenyl sulphide, on the other hand, is not affected by oxygen, whilst phenyl ether, when heated at 550° with sulphur, yields phenyl sulphide. It seems probable that in all these cases additive compounds are first formed. In the last case, this product would be phenyl sulphoxide, SOPh_2 , and this substance itself decomposes slowly at 340° into phenyl sulphide and oxygen (Krafft and Lyons, *Abstr.*, 1896, i, 297). In the same way, the preparation of phenyl sulphide and selenide from sulphobenzide, SO_2Ph_2 , by heating with sulphur or selenium, probably depends on the formation of an intermediate additive compound. Oxyphenyldisulphide, $\text{SO}_2\cdot\text{SPh}_2$, which would be formed by sulphur is known (Otto, *Annalen*, 1868, 145, 318), and this, when heated, actually yields sulphur dioxide and phenyl sulphide.

Selenious oxide is readily decomposed by sulphur at the temperature of melting sulphur. This replacement can be carried out as a lecture experiment in an atmosphere of carbon dioxide in a sealed tube. After cooling, the tube is found to contain black selenium and liquid sulphur dioxide.

Selenic acid is converted by sulphur at 55° into selenious acid, sulphuric acid being produced at the same time. Whilst the affinity for oxygen appears to decrease as the atomic weight rises in this group, that for chlorine increases, tellurium tetrachloride being the most stable, and sulphur tetrachloride the most easily decomposed. Corresponding with this, it is found that sulphur dichloride is decomposed both by selenium and tellurium, free sulphur being formed in both cases, together with a chloride of the element employed. A. H.

Replacements in the Phosphorus-Arsenic-Antimony Group.
By FRIEDRICH KRAFFT and R. NEUMANN (*Ber.*, 1901, 34, 565—569).—In the phosphorus group, it is found that arsenic replaces phosphorus,

and antimony both arsenic and phosphorus in the oxides, sulphides, and chlorides, whilst the order of replacement is the reverse of this with the triphenyl compounds. Phosphorous oxide is quantitatively decomposed by an excess of arsenic at 290° , arsenious oxide and phosphorus being produced, whilst both phosphorous and arsenious oxides are decomposed in a similar manner by antimony. In the same way, phosphorus trisulphide is decomposed by arsenic and by antimony, and arsenic trisulphide by antimony, at temperatures above 300° , more than 90 per cent. of the theoretical amount of product being in each case obtained. Phosphorus trichloride is scarcely affected by arsenic, but when a little arsenic chloride is added, the reaction proceeds almost quantitatively at 200° . The decomposition of phosphorus trichloride by antimony has previously been observed (Baudrimout, *Ann. Chim. Phys.*, 1864, [iv], 2, 5), and arsenic chloride undergoes a similar decomposition at 200° . On the other hand, triphenylarsine is quantitatively decomposed by phosphorus at 300° , whilst triphenylstibine is similarly decomposed by arsenic at 350° .
A. H.

Phenyl Telluride and the Atomic Weight of Tellurium. By O. STEINER (*Ber.*, 1901, 34, 570—572).—Phenyl telluride is readily volatile, and can be prepared pure and free from admixture with other compounds. The author has therefore very carefully estimated the carbon and hydrogen in this compound by combustion in presence of lead chromate, and from these results calculated the atomic weight of tellurium. The mean of five determinations gives the number 126.4 (oxygen = 16), which is distinctly less than the atomic weight of iodine, 126.85. An error of 0.1 per cent. in the carbon affects the atomic weight of tellurium by 0.5, and the separate numbers obtained vary from 126.1 to 126.7. The result is only regarded as a preliminary one to be confirmed by a direct estimation of the tellurium.
A. H.

Detection of Nitrogen in Arsenic, and the Conversion of Arsenic into Antimony. By FRIEDRICH FITTICA (*Chem. Zeit.*, 1901, 25, 41. Compare Christomanos, this vol., ii, 59).—Nitrogen in arsenic may readily be detected by conversion into boron nitride; the boron and arsenic are heated at 250 — 300° , and then extracted first with nitric, and then with hydrochloric acid, when the nitride remains undissolved; the solution, in addition to arsenic acid, contains a considerable amount of antimony chloride. In the author's opinion, the arsenic is resolved into nitrogen and antimony (compare this vol., ii, 59).
J. J. S.

Detection of Nitrogen in Arsenic, &c. By CARL ARNOLD and F. MURACH (*Chem. Zeit.*, 1901, 25, 131).—Fittica (preceding abstract) has stated that arsenic when heated with boron yields, not only antimony, but also boron nitride, and consequently contains nitrogen. The authors have repeated the experiments, using pure boron, prepared by igniting anhydrous borax with magnesium powder in a current of hydrogen. Not a trace of hydrogen or antimony could be obtained from pure arsenic.
L. DE K.

Behaviour of Arsenious Oxide towards Permanganate. By OTTO KÜHLING (*Ber.*, 1901, **34**, 404—406. Compare this vol., ii, 38).—When slightly alkaline solutions of arsenious oxide containing zinc sulphate are titrated with standard potassium permanganate solution, the colour rapidly disappears in the cold until 70—80 per cent. of the oxide is oxidised; beyond this point the coloration persists, and is destroyed only on prolonged heating of the solution at the temperature of the water-bath.

Arsenious oxide, when dissolved in boiling 30—40 per cent. sulphuric acid, is rapidly oxidised by the permanganate without the employment of zinc sulphate; towards the close of the titration, the solution requires to be heated for 1—2 minutes after each addition of oxidising agent.

G. T. M.

Action of Hydrogen Sulphide on Boron Bromide. By ALFRED STOCK and OTTO POPPENBERG (*Ber.*, 1901, **34**, 399—403).—*Metathioboric acid*, $B_2S_3 \cdot H_2S$, prepared by saturating a hot solution of boron bromide in carbon disulphide or benzene with dry hydrogen sulphide, crystallises from these solvents in long, white needles having an odour of hydrogen sulphide; this gas is evolved when the crystals are heated at 100° , and on raising the temperature to 300° pure boron sulphide remains. The molecular weight, as determined by the cryoscopic method in benzene, corresponds with that required by the above formula. During the preparation of the thio-acid, the tube conveying the hydrogen sulphide into the boron bromide solution rapidly becomes choked with crystals of the product, and the paper includes a description and sketch of an apparatus devised to overcome this difficulty. The thio-acid is energetically decomposed by water with the formation of hydrogen sulphide and boric acid; it undergoes a similar decomposition with alcohol, and appears to combine with ether; it differs markedly from the trisulphide in its solubility in benzene and carbon disulphide, one part dissolving in five parts of either of these solvents.

Hydrogen sulphide has no action on boron chloride below a dull red heat, and even then the reaction is only incomplete, the product being a mixture of boron sulphide and unaltered chloride.

G. T. M.

Argon and its Companions. By WILLIAM RAMSAY and MORRIS W. TRAVERS (*Proc. Roy. Soc.*, 1901, **67**, 329—333. Compare *Abstr.*, 1898, ii, 574; 1899, ii, 211).—The phosphorus previously used to remove oxygen from the mixture of atmospheric gases has been found to contain carbon, and the spectrum formerly attributed to a new element metargon is now referred to some carbon compound.

When a large amount of liquid air is allowed to evaporate quietly, the residue, after removal of the oxygen and nitrogen, consists of krypton, xenon, and argon, the last-mentioned being the main constituent. Argon is the most volatile of the three, and the separate gases may be obtained by alternate liquefaction and evaporation. At the temperature of boiling air, krypton has a considerable vapour pressure, whilst that of xenon is hardly appreciable.

To obtain neon and helium, the gas escaping from an air liquefier is used; this gas (consisting largely of nitrogen) is liquefied, and a

current of air is blown through the liquid; the first portion of the liquid to evaporate contains most of the neon and helium present in the air, along with oxygen, nitrogen, and argon. The oxygen and nitrogen are removed in the usual manner, and fractional distillation separates the neon and helium from the argon. Neon may be obtained free from helium by a few fractionations at the temperature of boiling hydrogen; neon is liquefied or perhaps solidified at this temperature, whilst helium remains in the gaseous state.

The five gases, helium, neon, argon, krypton, and xenon are all monoatomic, for the ratio of the specific heats, as determined by Kundt's method, is 1·66 in each case. Other physical constants are given below:

	Argon.	Krypton.	Xenon.
Refractivity (air = 1)	0·968	1·449	2·364
Density (O = 16)	19·96	40·88	64
Boiling point (abs. at 760 mm.)	86·9°	121·33°	163·9°
Critical temperature (abs.)	155·6°	210·5°	287·7°
Critical pressure (metres)	40·2	41·24	43·5
Vapour pressure ratio	0·0350	0·0467	0·0675
Weight (grams) of 1 cub. cm. liquid	1·212	2·155	3·52
Molecular volume.....	32·92	37·84	36·40

The refractivities of helium and neon are 0·1238 and 0·2345, their densities are 1·98 and 9·97 respectively; the critical temperature of neon is below 68° abs.

The compressibilities of the gases were measured at 11·2° and 237·3°. At 11·2°, as is known, the product p_v for hydrogen increases with rise of pressure, whilst for nitrogen it first decreases and then increases. With helium, the increase is more rapid than with hydrogen; with argon, there is first a considerable decrease followed at very high pressures by a gentle increase, although the product does not reach the theoretical value at 100 atmospheres pressure; with krypton, the change with rise of pressure is a still more marked decrease, and with xenon the decrease is very sudden. At the higher temperature, the results are more difficult to interpret.

The spectra of the gases have been measured by E. C. C. Baly. The colour of a neon tube is extremely brilliant and of an orange-pink hue; that of krypton is pale violet, and that of xenon is sky-blue.

The authors hold that the gases form a series in the periodic table (He = 4, Ne = 20, A = 40, Kr = 82, X = 128) between that of fluorine and that of sodium. They exhibit gradations in properties such as refractive index, atomic volume, melting point and boiling point, and the specific heat ratio has the same value for each gas. If the densities be regarded as identical with the atomic weights, as in the case of diatomic gases like hydrogen and oxygen, there is no place for the new elements in the periodic table. J. C. P.

Some Conditions of Reversibility. By ALBERT COLSON (*Compt. rend.*, 1901, 132, 467—469).—When dry silver carbonate is heated in a bsence of water vapour, there is a definite dissociation pressure

for a given temperature, whatever the mass of the silver carbonate, but the reaction is not reversible. In presence of a small quantity of water vapour, however, it is reversible.

Carbon monoxide reduces silver oxide energetically at 10° , but at -21° there is very little reduction, although sometimes the gas is absorbed or is replaced by an equal volume of carbon dioxide, silver carbonate being formed.

Red mercuric oxide has no action on carbon monoxide in the dark at the ordinary temperature, but the yellow oxide rapidly converts it into carbon dioxide. In the light, the red oxide blackens slowly in contact with carbon monoxide, and carbon dioxide is formed, whilst the yellow oxide rapidly absorbs carbon monoxide, causing a reduction of pressure simultaneously with the formation of carbon dioxide.

C. H. B.

Action of Acids on Carbonates of the Alkaline Earth Metals in Presence of Alcohol. By C. VALLÉE (*Compt. rend.*, 1901, 132, 677—678).—Calcium carbonate, when suspended in absolute alcohol, was decomposed with extreme slowness by sulphuric or acetic acid, the time required for the complete neutralisation of the acid being 4 months in the former case and $3\frac{1}{2}$ in the latter; similar results were obtained with nitric acid. Analogous experiments were made with strontium and barium carbonates, and it was found that the velocity of reaction in the case of the latter compound was much less than in that of the calcium salt. On employing dilute alcohol as the medium, the velocity of neutralisation is greatly increased, the rate of change diminishing with the time, and being proportional to the amount of water present; the reaction is not notably affected by temperature.

G. T. M.

Atomic Weight of Calcium. By ALEXANDER HERZFELD [and CARL STIEPEL] (*Ber.*, 1901, 34, 559—560).—The atomic weight of calcium obtained as a mean of three analyses of calcium carbonate, prepared from a solution of calcium hydrogen carbonate, is 39.673 (hydrogen = 1) or 39.962 (oxygen = 16).

A. H.

Formation and Composition of Bleaching Powder. By HUGO DITZ (*Zeit. angew. Chem.*, 1901, 14, 3—14, 25—31, 49—57, and 105—111).—According to the author, at low temperatures, 2 mols. of calcium hydroxide react with 1 mol. of chlorine, yielding the compound $\text{CaO}, \text{CaCl} \cdot \text{OCl}, \text{H}_2\text{O}$, which, if the temperature is not kept very low, undergoes dissociation under the influence of water into calcium hydroxide and the compound $\text{CaCl} \cdot \text{OCl}, \text{H}_2\text{O}$; the hydroxide then reacts with more chlorine, yielding the compound $2\text{CaCl} \cdot \text{OCl}, \text{H}_2\text{O} + \text{CaO}, \text{CaCl} \cdot \text{OCl}, \text{H}_2\text{O} + \text{H}_2\text{O}$ or $6\text{CaCl} \cdot \text{OCl}, \text{H}_2\text{O} + \text{CaO}, \text{CaCl} \cdot \text{OCl}, \text{H}_2\text{O} + \text{H}_2\text{O}$. With an increase in the amount of water present, it is possible to obtain bleaching powders of higher percentage, until finally a product containing only 0.61 per cent. of unchlorinated calcium oxide, in the form of $\text{CaO}, \text{CaCl} \cdot \text{OCl}, \text{H}_2\text{O}$, results.

The reactions may be written generally, $2n\text{Ca}(\text{OH})_2 + (2n-1)\text{CaCl}_2 = (2n-2)\text{CaCl} \cdot \text{OCl}, \text{H}_2\text{O} + \text{CaO}, \text{CaCl} \cdot \text{OCl}, \text{H}_2\text{O} + \text{H}_2\text{O}$.

The compound $\text{CaO}, \text{CaCl} \cdot \text{OCl}, \text{H}_2\text{O}$ does not lose its water at 100° ;

at higher temperatures, oxygen is evolved and the compound $\text{CaO}, \text{CaCl}_2, \text{H}_2\text{O}$ left behind.

The compound $\text{CaCl} \cdot \text{OCl}, \text{H}_2\text{O}$, which probably has the double molecular formula, evolves chlorine and water when heated at 100° in an atmosphere of dry carbon dioxide, leaving the compound $\text{CaO}, \text{CaCl} \cdot \text{OCl}, \text{H}_2\text{O}$.
J. J. S.

Formation of Magnesium Nitride by Heating Magnesium in Air. By WILHELM EIDMANN and L. MOESER (*Ber.*, 1901, 34, 390—393).—Magnesium nitride can be prepared by heating in air magnesium powder mixed with a number of oxides of metals which readily oxidise, and also by heating with certain metals and carbides. A mixture of equal parts of iron and magnesium, heated in an uncovered crucible, gave a crude product containing 36 per cent. of the nitride.

By heating magnesium powder strongly in a covered crucible with a minute opening in the cover, a lower layer of nitride is formed, covered with unchanged magnesium, and a surface layer of oxide. By carefully regulating the conditions, as much as 78—80 per cent. of nitride can be obtained in the product, a value approaching very nearly to that required for a complete absorption of the oxygen and nitrogen of the air (calc. 82.3 per cent.).
T. M. L.

Action of Substituted Ammonia Bases on Zinc Salts, and a New Method for the Estimation of Zinc. By W. HERZ (*Zeit. anorg. Chem.*, 1901, 26, 90—93).—When a solution of zinc sulphate is treated with methylamine or dimethylamine, a quantitative reaction takes place and zinc hydroxide and the sulphate of the base are formed. In the case of methylamine, an excess of this compound forms complex compounds with the precipitated zinc hydroxide, but these complex compounds are not formed with dimethylamine.

Zinc can be estimated accurately by precipitating the zinc salt with excess of dimethylamine, the precipitate of zinc hydroxide being then treated in the usual manner.
E. C. R.

Alkali-Copper Carbonates. By MAX GRÖGER (*Ber.*, 1901, 34, 429—432).—The silky, greenish-blue needles, which slowly form from a mixture of potassium hydrogen carbonate and copper sulphate solutions, probably have the composition $8\text{CuO}, 2\text{K}_2\text{CO}_3, 7\text{CO}_2, 17\text{H}_2\text{O}$. Sodium copper carbonate, $\text{Na}_2\text{CO}_3, \text{CuCO}_3, 3\text{H}_2\text{O}$, separates in the form of clusters of bright blue crystals, when a mixture is made of solutions of sodium, sodium hydrogen carbonate, and copper carbonate.

R. H. P.

Nature of Lead Amalgams. By HENRY FAY and EDWARD NORTH (*Amer. Chem. J.*, 1901, 25, 216—231).—Amalgams of lead were prepared of varying composition, and their rate of heating or cooling examined by means of a platinum-rhodium thermoelectric couple immersed in them, a marked decrease in the rate indicating the melting point. As the percentage of lead increases, the melting point remains practically constant; it is slightly above that of pure mercury, -39.4° . These amalgams are not entirely liquid; they grow

more and more pasty as the percentage of lead increases. By centrifugalising them in a chamois bag, crystals are obtained of the composition Pb_2Hg (compare Joule, this Journ., 1863, 16, 378). When the percentage of lead has reached 65, the amalgam is entirely solid; the melting point is 177° , and now increases proportionally to the increase in the lead until the melting point of pure lead is reached. These facts suggest that lead and mercury form a compound, Pb_2Hg , which is isomorphous with lead, and miscible with it, but only slightly soluble in mercury. The micro-structure of the solid amalgams confirms this idea of isomorphism; no separation into constituents is visible when these amalgams are etched.

C. F. B.

Behaviour of Lead Salts in Solution. By CARL L. VON ENDE (*Zeit. anorg. Chem.*, 1901, 26, 129—166).—The solubility of lead chloride in water containing hydrochloric acid and potassium chloride is determined. At 25.2° , the saturated solution of lead chloride in pure water contains 0.0388 gram-mol. per litre, the addition of hydrochloric acid diminishes the solubility, a minimum solubility of 0.00441 gram-mol. per litre being attained in 1.026*N* hydrochloric acid; the solubility then increases, becoming 0.1643 gram-mol. per litre in 12.05*N* acid. Similar results are obtained with potassium chloride, the minimum solubility, 0.00483 gram-mol. per litre (at 25.2°), being reached in 1.5018 *N* potassium chloride solution.

The application of the theory of the solubility of mixed electrolytes containing a common ion to the above results leads the author (certain plausible assumptions being made) to the conclusion that the aqueous solution of lead chloride is dissociated partly into PbCl' , partly into Pb^{++} ions. In the saturated solution, 6.2 per cent. of the salt is undissociated, 50.1 per cent. is dissociated into Pb^{++} and $2\text{Cl}'$ ions, and 43.7 per cent. into PbCl' and Cl' ions. Practically none of it is hydrolysed.

The solubility of lead bromide in water at 25.2° is 0.02628 gram-mol., and that of lead iodide 0.00158 gram-mol. per litre.

All three lead salts are more soluble in presence of nitric acid or potassium nitrate, which is explained by the formation of PbNO_3^+ ions; this diminishes the number of Pb^{++} ions in solution and so causes dissociation of a further quantity of lead chloride which is replaced by the dissolution of the solid salt.

T. E.

Dissolution of Solid Metals in Mercury, and more generally in other Fused Metals. By M. BERTHELOT (*Compt. rend.*, 1901, 132, 290—291).—The liquids obtained by the dissolution of metals in mercury and fused metals are to be compared with emulsions rather than with ordinary solutions, and the spontaneous solidification of certain amalgams used in dentistry may be regarded as analogous to coagulation. The softening and disintegrating action of mercury on metals resembles the action of water on colloidal substances, either organic or inorganic. The results of the author's previous experiments on the heats of transformation of allotropic modifications of silver and on the heats of formation of silver amalgams are independent

of our ideas as to the nature of metallic solutions, since, in the experiments referred to, the final states were identical in all cases and the heat developed therefore truly represented the differences in the energy of the initial states.

N. L.

Indium. By CAMILLE CHABRIÉ and ETIENNE RENGADÉ (*Compt. rend.*, 1901, 132, 472—475).—Dilute aqueous solutions of indium caesium alum, when boiled for a long time, yield a precipitate of indium oxide free from caesium or sulphuric acid; whilst indium rubidium alum is almost completely decomposed, and yields a precipitate of indium oxide containing also sulphuric acid and rubidium. The composition of indium rubidium alum agrees with that required by the ordinary formula; 100 parts of water dissolve 44.28 parts of the salt at 15°.

The boiling points of solutions of indium acetylacetonate in ethylene bromide show that the indium is trivalent; similar experiments with aluminium and iron acetylacetonates show that those metals are also trivalent under the same conditions. Combes' determination of the vapour density of aluminium acetylacetonate also showed that the aluminium was trivalent. It would seem clear therefore, that indium is analogous to iron and aluminium, and there is little reason to doubt that at the ordinary temperature the formula of its chloride is In_2Cl_6 . It is noteworthy, however, that indium readily forms an amalgam and in this respect resembles the metals of the zinc group.

C. H. B.

A New Cobalt Silicide. By PAUL LEBEAU (*Compt. rend.*, 1901, 132, 556—558. Compare *Abstr.*, 1899, ii, 427).—*Cobalt silicide*, CoSi , is produced in the form of prismatic needles by heating for 4—5 minutes in a carbon crucible placed in the electric furnace a mixture of copper silicide and metallic cobalt; when an electric current of 950 amperes and 50 volts is employed, the yield is 95 per cent. of the theoretical. The new compound melts at 1300° in a current of hydrogen, and has sp. gr. 6.30 at 20°.

Cobalt silicide is decomposed into fluorides with incandescence when gently heated in a current of fluorine; chlorine reacts only at a dull red heat; hydrogen fluoride or chloride decomposes the substance at high temperatures, yielding hydrogen and the corresponding haloid compounds of silicon and cobalt. Sulphur has no action on the compound at the fusing point of glass; oxygen, nitrogen, ammonia, and steam, under these conditions, decompose the silicide only superficially; hydrogen sulphide, at high temperatures, gives rise to sulphides of cobalt and silicon. Nitric and sulphuric acids do not attack the silicide; it dissolves, however, slowly in aqua regia, and more rapidly in hydrochloric acid.

Cobalt silicide is insoluble in dilute alkaline solutions, but is decomposed by the alkali hydroxides, either fused or in concentrated solutions. Fused potassium nitrate and potassium hydrogen sulphate have no action on the substance; melted potassium carbonate attacks it only slowly.

G. T. M.

Ammoniacal Arsenates of Cobalt and Nickel ; Application in the Estimation of Arsenic. By O. DUCRU (*Ann. Chim. Phys.*, 1901, [vii], 22, 160—238. Compare this vol., ii, 23, 73, 125).—A detailed account of work already published. G. T. M.

Action of Water on Molybdenum Pentachloride. By MARCEL GUICHARD (*Bull. Soc. Chim.*, 1901, [iii], 25, 188—191).—The liquid obtained by the action of water on molybdenum pentachloride exhibits all the characters of a solution of the tetrachloride, and quantitative experiments show that decomposition occurs according to the equation $2\text{MoCl}_5 + 3\text{H}_2\text{O} = \text{MoCl}_4 + \text{MoO}_3 + 6\text{HCl}$. When exposed to the air, the solution becomes blue, and then contains the oxide $\text{MoO}_3, 4\text{MoO}_3$. N. L.

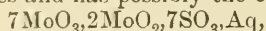
New Crystallised Molybdenum Sulphate. By G. BAILHACHE (*Compt. rend.*, 1901, 132, 475—478).—When a rapid current of hydrogen sulphide is passed through a boiling solution of molybdenum trioxide in six times its weight of sulphuric acid, the compound $\text{Mo}_2\text{O}_5, 2\text{SO}_3$ is obtained as a mass of black, olive prisms, slowly but completely soluble in water, and yielding a deep brown solution if kept out of contact with air. When exposed to air, the compound deliquesces and its aqueous solution becomes green and then blue. The brown solution is readily oxidised to molybdic acid ; when mixed with an alkali molybdate, it yields the blue molybdenum oxide, and when mixed with an alkali it yields a soluble molybdate and a precipitate of hydrated molybdenum dioxide.

When heated alone, the compound yields molybdic, sulphuric, and sulphurous oxides ; hot sulphuric acid converts it into the compound $\text{MoO}_3, \text{SO}_3$; hydrogen at a red heat converts it into molybdenum dioxide and sulphuric acid, and dry ammonia also reduces it at a dull red heat. When heated with an intimate mixture of sodium chloride or bromide, it yields molybdenum oxychloride, MoO_2Cl_2 , or the oxybromide, together with molybdenum dioxide, sodium anhydrosulphate, and sodium anhydromolybdate, the proportions of the two latter depending on the duration of the operation. C. H. B.

Reduction of Molybdosulphuric Acid by Alcohol. By E. PÉCHARD (*Compt. rend.*, 1901, 132, 628—631).—When alcohol is gradually added to a solution of molybdic acid in sulphuric acid and the liquid warmed on the water-bath for a short time, diluted, and neutralised with ammonia, a crystalline precipitate is produced which consists of a mixture of two compounds, one, of the composition $5\text{NH}_3, \text{MoO}_2\text{SO}_3, 7\text{MoO}_3, 8\text{H}_2\text{O}$, crystallising in blue, hexagonal plates, and the other, $3\text{NH}_3, \text{MoO}_2\text{SO}_3, 7\text{MoO}_3, 10\text{H}_2\text{O}$, in dark blue prisms ; the latter is converted into the former by the further action of ammonia. Both these compounds are very soluble in water, but insoluble in solutions of ammonium salts ; they are only very slowly decomposed by alkalis or nitric acid at the ordinary temperature, and are therefore more stable than the other blue compounds of molybdenum which have been described. Analogous compounds containing potassium, and both potassium and ammonium, have also been obtained, but the corresponding sodium salt is too soluble to admit of isolation.

The prolonged reduction of molybdic acid by alcohol at the ordinary

temperature results in the formation of a *compound* which crystallises in slender, black needles and has possibly the composition



whilst if the operation is effected at 100° , solutions are obtained which, when cooled, are immediately decomposed by ammonia. N. L.

Tungsten. By EDOUARD DEFACQZ (*Ann. Chim. Phys.*, 1901, [vii], 22, 238—288).—A detailed account of a series of contributions to the chemistry of tungsten. The results have, however, already been published (compare Abstr., 1897, ii, 77, 163, 214; 1898, ii, 521; 1899, ii, 159, 428, 489, 754; 1900, ii, 350; this vol., ii, 105). Traces of tungsten are most readily detected by fusing the substance under examination with potassium hydrogen sulphate, treating the fused mass with dilute sulphuric acid, and adding to the extract a few drops of phenol or quinol solution; the former reagent develops a red, and the latter a violet, coloration. The phenols in general, and also many of the alkaloids, give characteristic reactions with acid solutions of tungstic acid. G. T. M.

New Method of Determining the Atomic Weight of Uranium. By JULES ALOY (*Compt. rend.*, 1901, 132, 551—553).—The atomic weight of uranium may be easily and accurately determined by estimating the relative proportions of nitrogen and the metal in the carefully purified nitrate. The nitrogen is estimated by a modification of Dumas' method, and the uranium is weighed as the dioxide, UO_2 , obtained by reducing in a current of hydrogen the residue left on to calcining the nitrate in the preceding estimation. It is advantageous to employ in this estimation the nitrate, $\text{UO}_2(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$, obtained by partially dehydrating the hexahydrate in a desiccator, under diminished pressure. Assuming that the atomic weight of nitrogen is 14.04, the mean of seven concordant determinations of the atomic weight of uranium is 239.4. G. T. M.

Enantiotropy of Tin. VI. By ERNST COHEN (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 3, 469—472).—Classical authors, for instance, Aristotle, appear to have been aware of the changes which tin may undergo at low temperatures. L. M. J.

Double Compounds of Quadrivalent Titanium. By ARTHUR ROSENHEIM and OTTO SCHÜTTE (*Zeit. anorg. Chem.*, 1901, 26, 239—257).—Titanium tetrachloride or hydroxide dissolves in fuming hydrochloric acid, forming a deep yellow solution. Alcoholic or ethereal solutions of hydrochloric acid also dissolve the hydroxide readily, and when the ethereal solution is evaporated a microcrystalline, yellowish residue is obtained, which may be washed with ether, but cannot be dried without decomposition. It appears to be either $\text{TiCl}_3 \cdot \text{Et}_2\text{O}$, or $\text{TiCl}_3 \cdot \text{OH} \cdot \text{Et}_2\text{O}$.

Ammonium titanichloride, $(\text{NH}_4)_2\text{TiCl}_6 \cdot 2\text{H}_2\text{O}$, is obtained by shaking the solution of titanium tetrachloride in fuming hydrochloric acid with the theoretical quantity of ammonium chloride for 12 hours in the cold and washing with ether. It is a yellow, crystalline substance which very readily loses hydrochloric acid in moist air.

Pyridine titanichloride, $(\text{C}_5\text{H}_5\text{N})_2 \cdot \text{H}_2\text{TiCl}_6$, is deposited in yellow

crystals from a solution of pyridine hydrochloride, and titanichloride in hydrochloric acid. It decomposes when exposed to air or dissolved in water.

Quinoline titanichloride, $(C_9H_7N)_2, H_2TiCl_6$, is more stable than the foregoing compound.

Aniline titanichloride, $(NH_2Ph)_4, H_4TiCl_8$, obtained in the same way, is fairly stable in the air.

Ammoniotitanium tetrachloride, $TiCl_4, 6NH_3$, is an amorphous, dark yellow powder obtained by passing dry ammonia into an ethereal solution of titanium tetrachloride; it loses ammonia in presence of dry calcium chloride, and becomes almost colourless, the residue having the composition $TiCl_4, 4NH_3$. Both compounds are very unstable in presence of moist air.

Titanium tetrachloride pyridine, $TiCl_4, 6C_5H_5N$, was obtained in the same way as the analogous ammonia compound.

Solutions of hydrobromic acid in water, alcohol, or ether dissolve titanium tetrabromide or hydroxide, yielding dark red liquids. From the ethereal solution, a crystalline substance was obtained, which was too unstable to permit of analysis. When evaporated in a vacuum, the alcoholic solution deposits a colourless, crystalline powder, which is stable when exposed to air, and appears to be $TiBr(OH)_3, 1\frac{1}{2}H_2O$.

The solution in aqueous hydrobromic acid gives a crystalline compound with ammonium bromide, which is much less stable than the corresponding chloride.

Pyridine titanibromide, $(C_5H_5N)_2, H_2TiBr_6$, is obtained by saturating with hydrogen bromide a solution containing pyridine hydrobromide and titanichloride dissolved in alcoholic hydrogen bromide. This solution, when it is not treated with hydrogen bromide, deposits crystals of $3(C_5H_5N, HBr), TiOBr_2$.

The iodine analogues of the compounds above described could not be prepared owing to their great instability.

A solution of titanium tetrachloride in ether acts on lead thiocyanate, yielding what appears to be a titanium salt of a polymeric thiocyanic acid.

Titanium sulphates.— $TiOSO_4, 5H_2O$, is obtained by boiling titanichloride with alcoholic sulphuric acid and evaporating the alcohol or precipitating with excess of ether. The salt, $2K_2SO_4, 3TiOSO_4, 10H_2O$, is deposited in colourless needles when a concentrated aqueous solution of potassium sulphate is added to a saturated solution of titanichloride in concentrated sulphuric acid. The ammonium salt, $(NH_4)_2SO_4, TiOSO_4, H_2O$, is obtained similarly.

Titanium Oxalates.—Concentrated solutions of acid ammonium oxalate dissolve titanichloride, forming the salt $TiO(C_2O_4NH_4)_2, H_2O$, which crystallises in large, transparent, monoclinic crystals. The oxalate, $TiOC_2H_4, Et.OH$, is obtained as a white, crystalline precipitate readily soluble in water or alcohol by boiling titanichloride with alcoholic oxalic acid and precipitating the solution with ether. The compound $C_2O_4(TiO)_2, 12H_2O$ is obtained by adding a concentrated solution of oxalic acid to a solution of titanichloride in hydrochloric acid and precipitating with alcohol. It is insoluble in water and sparingly soluble in dilute acids.

Titanium Tartrates.—Hot concentrated solutions of acid alkali tartrates dissolve precipitated titanium hydroxide readily. The solutions solidify, when concentrated, to gelatinous substances possessing the composition $2\text{R}_2\text{O}, 2\text{TiO}_2, 3\text{C}_4\text{H}_4\text{O}_5, x\text{H}_2\text{O}$, x being 6 for the potassium and 10 for the sodium and ammonium salts. The salt, $\text{Ti}(\text{C}_4\text{H}_4\text{O}_6)_2 \cdot 4\text{H}_2\text{O}$, was obtained by saturating a concentrated aqueous solution of tartaric acid with titanium hydroxide and evaporation. It formed a syrup which was dried on porous earthenware. Its solutions are characterised by their high specific rotatory power, a solution of 1.5 grams in 100 c.c. giving $[\alpha]_D 140.8^\circ$ at 15° .

When a solution of titanous acid in hydrochloric acid is treated with tartaric acid and a large excess of alcohol, a white, amorphous precipitate is obtained of the compound $\text{C}_4\text{H}_4\text{O}_6(\text{TiO})_2 \cdot 7\text{H}_2\text{O}$. It is insoluble in water, but readily soluble in dilute acids or ammonia.

T. E.

Platinum Compounds. By ARTURO MIOLATI and I. BELLUCCI (*Gazzetta*, 1900, 30, ii, 588—596).—The authors have made several unsuccessful attempts to prepare compounds of the composition $\text{PtX}_4(\text{OH})_2\text{H}_2$, X representing CN, CNS, or NO_2 .

Silver dichloroplatinicyanide, $\text{Ag}_2(\text{PtCl}_2\text{Cy}_4)_2$, obtained in the form of a pale yellow precipitate, is not decomposed by heating with water under pressure or by the action of chlorine. The corresponding dibromo- and diiodo-salts, forming respectively yellow and chestnut precipitates, behave in a similar manner towards water.

Bromine acts on potassium platothiocyanate according to the equation: $2\text{Pt}(\text{CNS})_4\text{K}_2 + \text{Br}_2 = \text{Pt}(\text{CNS})_6\text{K}_2 + \text{Pt}(\text{CNS})_2 + 2\text{KBr}$.

The reaction between potassium platinitthiocyanate and platinitbromide gives rise to platinous thiocyanate and potassium bromide.

Silver platinitnitrobromide, $\text{Pt}(\text{NO}_2)_4\text{Br}_2\text{Ag}_2$, is obtained as a red precipitate which is too unstable to allow of the bromine atoms being replaced by hydroxyl groups.

T. H. P.

Some Ruthenium Compounds. By ARTURO MIOLATI and C. C. TAGIURI (*Gazzetta*, 1900, 30, ii, 511—529).—When chlorine acts on a mixture of sodium chloride and ruthenium chloride, and the product of the reaction is lixiviated with water, a dark red liquid is obtained, containing probably sodium ruthenichloride. If the solution be hot and dilute or be placed in contact with organic substances, it becomes more brown in colour and is found to contain ruthenium trichloride, since the addition of potassium chloride precipitates the compound of the composition $\text{K}_2\text{RuCl}_5 \cdot \text{H}_2\text{O}$, whilst evaporation of the mother liquors yields the substance K_2RuCl_5 .

On boiling together solutions of sodium ruthenochloride (Na_2RuCl_5) and sodium hydrogen sulphite, a minute, crystalline precipitate of the composition $\text{Na}_7\text{Ru}(\text{SO}_3)_5 \cdot 2\text{H}_2\text{O}$, is obtained. The corresponding potassium compounds give, after the addition of aqueous potassium hydroxide, a blue compound of the composition $\text{O}[\text{Ru}(\text{SO}_3)_4\text{K}_6]_2 \cdot 4\text{H}_2\text{O}$.

The action of sodium hydrogen sulphite on sodium rutheninitrosochloride yields the compound $\text{O}[\text{Ru}(\text{SO}_3)_2(\text{NO})\text{Na}_2]_2 \cdot 2\text{H}_2\text{O}$, which separates in the form of minute, orange-yellow crystals slightly

soluble in cold water. The corresponding *potassium* compound separates in minute needles also containing $2\text{H}_2\text{O}$.

For the analysis of these complex salts, the authors have devised special methods, of which a full description is given. T. H. P.

Ruthenium and its Compounds. By UBALDO ANTONY and ADOLFO LUCCHESI (*Gazzetta*, 1900, 30, ii, 539—544).—*Ruthenium trisulphide*, RuS_3 , is obtained as a yellowish-brown precipitate when hydrogen sulphide is passed into a solution of potassium ruthenichloride kept at 0° . In the dry state, the sulphide is readily oxidised in the air and becomes heated to incandescence, so that it is necessary to dry it in an atmosphere of carbon dioxide.

If the hydrogen sulphide and potassium ruthenichloride react at 80 — 90° , ruthenium disulphide is obtained as a black precipitate which must be dried in the same way as the trisulphide. When gently heated in presence of air, even although the latter be diluted with nitrogen, a violent explosion occurs. T. H. P.

Mineralogical Chemistry.

Analysis of Tetrahedrite from Mount Botes, Hungary. By JOZSEF LOCZKA (*Zeit. Kryst. Min.*, 1901, 34, 84—87).—The following results, the mean of two analyses, were obtained with tetrahedral crystals of tetrahedrite, of which a crystallographic description is given by K. Zimányi in an accompanying paper (*ibid.*, 78—83). The streak is dark brownish-black; on the bright, uneven fracture no impurities could be seen. Sp. gr. 4.968.

S.	Sb.	As.	Cu.	Ag.	Pb.	Fe.	Mn.
25.16	26.61	0.38	37.22	1.51	0.33	0.80	0.69
		Zn.	Insol.	Total.			
		6.59	0.06	99.35			

No simple formula can be deduced from these figures (compare Abstr., 1900, ii, 21). L. J. S.

Strontianite from Münster-land. By JOSEPH BEYKIRCH (*Jahrb. Min.*, 1901, *Beil.-Bl.*, 13, 389—433).—A description is given of the strontianite which occurs with calcite in veins in chalk-marl at various localities in Westphalia. In seventeen new analyses the constituents vary as follows: SrCO_3 , 88.69—94.29; CaCO_3 , 5.61—11.12; traces of ferrous carbonate and silica are sometimes present. Sp. gr. 3.628—3.728. Analyses are also given of “calcistrontianite” (compare Abstr., 1896, ii, 660). Detailed crystallographic and optical determinations are also given [$a:b:c=0.60903:1:0.72399$]. There appears to be a connection between the slight variation in the divergence of the optic

axes and the amount of calcium carbonate present; the latter, therefore, probably replaces strontium carbonate isomorphously.

L. J. S.

Dolomite [Ankerite] from Magdeburg. By JOHANNES FAHRENHORST (*Zeit. Naturwiss.*, 1900, 73, 275—279).—A mineral referred to dolomite occurs with calcite, barytes, pyrites and copper-pyrites in crevices in greywacke at Ebendorf near Magdeburg. Analysis I is of colourless, translucent rhombohedra with $r' = 73^\circ 50'$; and II of small curved rhombohedra with a pearly lustre. [This composition points to ankerite rather than dolomite.]

	CaO.	FeO.	MgO.	MnO.	SiO ₂ .	Sp. gr.
I.	28.69	14.01	11.95	0.86	0.16	2.96
II.	31.95	10.71	10.53	2.37	0.08	—

L. J. S.

Phosphates from Moravia. By CONRAD H. VON JOHN (*Chem. Centr.*, 1901, i, 417; from *Verh. geol. Reichsanst., Wien*, 1900, 337—340).—The minerals analysed occur in cavities in pegmatite at Cyrillhof near Gross-Meseritsch in Moravia; they are mixtures to which it would not be advisable to give special names. I is dark brown and amorphous with a sub-conchoidal fracture and a greasy lustre; it is very similar to triplite, but differs in containing no fluorine; the composition may be represented by $9R''_3P_2O_8 + (R_2O_3)_3(P_2O_5)_2$. II is black with a conchoidal fracture and greasy lustre. III is dark blackish-brown with an irregular earthy fracture.

	P ₂ O ₅ .	Al ₂ O ₃ .	FeO.	Fe ₂ O ₃ .	MnO.	CaO.	MgO.	K ₂ O.
I.	39.65	0.46	26.09	9.51	18.18	3.86	0.07	0.81
II.	32.50	—	0.36	26.66	28.66	2.68	—	—
III.	31.60	—	3.09	27.91	26.83	2.82	—	—

	Na ₂ O.	Cl.	SiO ₂ .	H ₂ O.	Total.
I.	1.12	0.14	—	—	99.89
II.	—	—	0.62	9.12	100.60
III.	—	—	—	9.16	101.41

L. J. S.

Triplite from Moravia. By CONRAD H. VON JOHN (*Chem. Centr.*, 1901, i, 416; from *Verh. geol. Reichsanst., Wien*, 1900, 335—337).—Massive, dark brown triplite was found in a nest in pegmatite at Wien near Gross-Meseritsch in Moravia. It is frequently intergrown with large plates of muscovite. On the fresh sub-conchoidal fracture it has a greasy lustre. Analysis gave:

F.	P ₂ O ₅ .	FeO.	MnO.	CaO.	MgO.	K ₂ O.	Na ₂ O.	Total.
8.17	31.29	31.03	31.05	1.42	trace	0.72	0.52	104.20

This agrees with the usual formula, $R_3P_2O_8.RF_2$, with Fe : Mn = 1 : 1.

L. J. S.

Formation of Oceanic Salt Deposits, particularly of the Stassfurt Beds. XIX. Maximum Vapour Pressure at 25° of Solutions of the Chlorides and Sulphates of Magnesium and Potassium, the Solutions being Saturated with Sodium Chloride: the Formation of Kainite at 25° . By JACOBUS H. VAN'T HOFF and H. VON EULER-CHELPIK (*Sitzungsber. Akad. Wiss. Berlin*, 1900, 1018—1022. Compare Abstr., 1900, ii, 23).—The contents of the paper are indicated by the title. The results obtained are considered in connection with the order in which various salts separate out on the evaporation of sea water (*loc. cit.*). J. C. P.

Formation of Oceanic Salt Deposits, particularly of the Stassfurt Beds. XX. Formation of Syngenite at 25° . By JACOBUS H. VAN'T HOFF and HAROLD A. WILSON (*Sitzungsber. Akad. Wiss. Berlin*, 1900, 1142—1149).—The conditions of formation of syngenite, $\text{CaK}_2(\text{SO}_4)_2 \cdot \text{H}_2\text{O}$, have been studied on the same lines as were followed in the case of glauberite (Abstr., 1900, ii, 284). Syngenite is obtained by shaking gypsum with a sufficiently concentrated solution of potassium sulphate, but is decomposed on contact with water or a dilute solution of potassium sulphate. The conditions of the existence of syngenite at 25° have been studied (1) in solutions containing no magnesium, (2) in solutions containing magnesium; in the latter case, matters are complicated by the possible formation of polyhalite, $\text{Ca}_2\text{K}_2\text{Mg}(\text{SO}_4)_4 \cdot 2\text{H}_2\text{O}$. The results are treated graphically, and do not lend themselves to abstraction. J. C. P.

Theory of Silicates. By W. VERNADSKY (*Zeit. Kryst. Min.*, 1901, 34, 37—66).—The author divides the silicates into two main groups, (A) "simple" silicates containing no sesquioxides and (B) aluminosilicates (including ferrisilicates, borosilicates and chromosilicates); these are subdivided as shown below. The following may be given as examples of the term "additive product": hemimorphite ($\text{Zn}_2\text{SiO}_4 \cdot \text{H}_2\text{O}$) is considered as an additive product of calamine (Zn_2SiO_4), and in serpentine there is the addition of a metasilicate portion to an orthosilicate "nucleus."

A. Simple silicates.

I. Hydrates. Opal group.

II. Salts.

a. Orthosilicates.

1. Salts. Olivine, troostite and sepiolite groups.

2. Additive products. Chondrodite, serpentine, chrysocolla, noumeaite and calamine groups.

b. Metasilicates.

Pyroxene (and amphibole), talc and apophyllite groups.

B. Aluminosilicates.

I. Complex anhydrides and additive products. Sillimanite group.

II. Complex acids (hydrates) and additive products. Clay group.

III. Complex salts and additive products.

a. Salts with "chlorite nucleus." Stauroilite, clintonite, chlorite and melilite groups.

b. Salts with "mica nucleus." Mica, leucite, felspar, petalite, nepheline, caïpholite, scapolite, epidote, garnet, idocrase, prehnite and zeolite groups.

Each of the above groups is discussed in detail, and structural formulæ are given. The following groups form an appendix to the classification. C, beryllium silicates. D, borosilicates; *a*, simple borosilicates, *b*, borooalumosilicates. E, cerium and yttrium silicates. F, Titanosilicates. G, zirconosilicates. H, uranosilicates.

L. J. S.

[Enstatite from Massachusetts.] By BENJAMIN KENDALL EMERSON (*Jahrb. Min.*, 1901, i, Ref. 36; from *Monograph U.S. Geol. Survey*, 1898, 29, 754—761).—Supplementary notes are given on the minerals of Franklin, Hampshire. and Hampden counties, Massachusetts (Abstr., 1897, ii, 566). The following analysis by Hillebrand is given of large, colourless prisms of slightly altered enstatite from the serpentine of Granville:

SiO ₂ .	Al ₂ O ₃ .	Cr ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	NiO.	MnO.	MgO.
54.04	0.52	0.14	1.51	3.90	0.23	0.11	34.40
K ₂ O, Na ₂ O.		H ₂ O < 110°.	H ₂ O > 110°.	CO ₂ .	Total.		
0.08		0.70	3.07	1.32	100.02		

L. J. S.

Chloropal from Moravia. By CONRAD H. VON JOHN (*Chem. Centr.*, 1901, i, 416; from *Verh. geol. Reichsanst., Wien*, 1900, 340—341).—Yellowish-green, earthy or compact chloropal occurs at Gdossau and Pulitz near Jamnitz in Moravia. The following analysis gives the usual formula, Fe₂Si₃O₉, 5H₂O.

SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	CaO.	MgO.	H ₂ O.	Total.
41.80	0.91	35.29	1.04	0.92	20.36	100.32

L. J. S.

New Mineral Occurrences in Canada. By G. CHRISTIAN HOFFMANN (*Amer. J. Sci.*, 1901, [iv], 11, 149—153).—Lepidolite occurs as large plates, up to 28 inches across, in a coarse granite vein in the township of Wakefield, Ottawa Co., Quebec. Thin laminæ are transparent and colourless, but thick plates are purplish-brown. Sp. gr. 2.858. Analysis by R. A. A. Johnston gave:

SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	MnO.	MgO.	K ₂ O.	Na ₂ O.
47.89	21.16	2.52	4.19	0.36	10.73	1.34
				Total.		
				less O for F.		
Li ₂ O.		H ₂ O.	F.	99.82		
5.44		1.90	7.41			

A colourless, transparent substance from the interspaces in the ivory of the tusk of a fossil mammoth found in the Yukon district, North-west Territory, gave on analysis by Johnston:

P ₂ O ₅ .	MgO.	NH ₃ .	CO ₂	H ₂ O.	Total.
38.53	21.93	1.94	0.42	[37.18]	100.00

This composition is explained by assuming that the substance is a mixture of two mols. of struvite ($\text{NH}_4\text{MgPO}_4 \cdot 6\text{H}_2\text{O}$) with one of newberyite ($\text{HMgPO}_4 \cdot 3\text{H}_2\text{O}$) and a little magnesite.

A massive velvet-black mineral occurring in considerable masses as an accessory constituent in the nepheline-syenite of the Ice River, British Columbia, is shown by the following analysis by F. G. Wait to be schorlomite. Sp. gr. 3.802. In the figures given below, TiO_2 , TiO , Fe_2O_3 and FeO have been recalculated to agree with the garnet formula.

SiO_2	TiO_2	Al_2O_3	Fe_2O_3	TiO	MnO	CaO	MgO	Total.
25.77	10.83	3.21	18.59	8.23	0.76	31.76	1.22	100.37

Danalite, spodumene and uranophane are also described.

L. J. S.

Recalculation of Rock Analyses. By JAMES FURMAN KEMP (*School of Mines Quart., New York*, 1900, 22, 75—88).—Tables are given for finding the molecular ratios of the various constituents shown in percentage analyses of rocks. A worked example shows the method of calculating the mineralogical composition from the percentage chemical composition.

L. J. S.

Rocks from the Newlands Diamond Mines, S. Africa. By THOMAS GEORGE BONNEY (*Proc. Roy. Soc.*, 1901, 67, 475—484. Compare Abstr., 1899, ii, 769).—A description is given of another small collection of rock specimens from this locality. An analysis is given of a specimen of the "blue ground" which contains an unusual abundance of minute scales of brown mica. Microscopic diamonds have been found in the eclogite described in the previous paper. L. J. S.

Cosmic Diffusion of Vanadium. By CLAS BERNHARD HASSELBERG (*Öfvers. Svenska. Vetensk. Akad. Förhandl.*, 1899, 56, 131—140. Compare Abstr., 1898, ii, 30).—A number of meteorites, fallen in various parts of the world, have been examined spectroscopically for the presence of vanadium. Of the 31 specimens investigated, it was found that all those of the stony type contain small proportions of vanadium, which was, however, only detected in one metallic meteorite, and then only in very small quantity. This fact seems to indicate a different origin for stony and for metallic meteorites. The observation of Lockyer (*Phil. Trans.*, 1894, 185, 1023) of the presence of vanadium in specimens of meteoric iron from Nejed and Obernkirchen is erroneous, since of the four lines given by him as belonging to vanadium, only two approximate to lines of this metal, besides which no trace appears of the principal group of vanadium lines with $\lambda = 4408\text{—}4379$. Further, the author has directly compared the spectra of the Nejed meteorite and of vanadium, and failed to discover in the former the lines given by Lockyer.

T. H. P.

Granular and Compact Meteoric Irons. By EMIL W. COHEN (*Sitzungsber. Akad. Wiss. Berlin*, 1900, 1122—1135).—A summary is given of the author's several recent papers on meteoric irons, of which

the structure is compact or granular (ataxites). A comparison of the analyses shows that, with few exceptions, there is a close relation between structure and chemical composition, as is also the case in other groups (hexahedrites and octahedrites) of meteoric irons.

L. J. S.

Analysis of the Mineral Water of the Cévennes Spring at Ucel (Ardèche). By ETIENNE BARRAL (*Bull. Soc. Chim.*, 1901, [iii], 25, 257—259).—This water has a temperature of 16°, contains 134 c.c. of free carbon dioxide per litre, and yields a solid residue of 2.357 grams per litre, consisting chiefly of magnesium and sodium sulphates and sodium and calcium carbonates.

N. L.

Occurrence of Barium in the Spring Water of Boston Spa. By PERCY A. E. RICHARDS (*Analyst*, 1901, 26, 68—70. Compare White, *Abstr.*, 1899, ii, 420).—The author has found that the spring water of Boston Spa contains the remarkably large amount of 41 parts of barium chloride per 100,000. The presence of this salt has not been in the least suspected during the last 100 years. Full analyses of the water are given.

L. DE K.

Physiological Chemistry.

Gastric Digestion in Selachian Fishes. By ERNST WEINLAND (*Zeit. Biol.*, 1901, 41, 35—68).—The food remains in the stomach of the dogfish, torpedo, and ray, if the animals are kept at 13—15°, 2, 3, or more (in one case 18) days. The gastric juice of dogfish and torpedo is always acid; in dead and moribund animals, it is alkaline. In the ray, it is sometimes acid, sometimes alkaline; an alkaline secretion can always be artificially obtained in this animal, but not in the other two, by subcutaneous injection of extract of *Secalis cornuti*. This drug causes a contraction of the vessels of the mucous membrane to such an extent that the circularly arranged fibres form sphincters which prevent the blood flowing.

W. D. H.

Cellulose Digestion in the Alimentary Canal. By ERICH MÜLLER (Berlin) (*Pflüger's Archiv*, 1901, 83, 619—627).—Several previous workers (Knaute; Biedermann and Moritz, *Abstr.*, 1898, ii, 166, &c.) have stated that a cellulose-dissolving enzyme occurs in the secretion of the hepato-pancreas of certain invertebrates. In the present experiments, paper was employed, but a loss of paper and a formation of sugar were never found, and the search for a cellulose-dissolving enzyme was entirely negative. Indeed, in control experiments, in which the secretion and alkaline solution were alone used without the paper, more sugar was often found than in the experiments where paper was added.

W. D. H.

Digestion of Food by Man. By WIEBUR O. ATWATER and FRANCIS G. BENEDICT (10th Ann. Rep. Storrs's Agr. Exper. Stat. for 1897, 154—167).—The observations are part of a series of metabolism experiments with respiration calorimeter (compare *ibid.*, No. 9, 1896, 163). During a preliminary experiment, the body was brought into approximate equilibrium with the food, and the muscular activity was made as similar in amount as possible to that of the second period. At the last meal of the day previous to the commencement of each experiment, animal charcoal was consumed, to enable the separation of the faeces of the experimental period to be effected. Samples of the dried food, faeces, and urine were burned in the bomb calorimeter.

The actual fuel value of food is considered to be the heat of combustion of the portion oxidised (or oxidisable) in the body, or the heat of combustion of the total food less the heats of combustion of the un-oxidised excrementitious matters.

It is pointed out that what is usually termed the digestibility of foods would be more correctly designated availability.

The results relating to the various foods are given in tables.

N. H. J. M.

Digestibility of Butter and its Substitutes. By H. WIBBENS and H. E. HUIZENGA (*Pflüger's Archiv*, 1901, 83, 609—618).—The digestibility of butter is contrasted by actual feeding experiments with those of "sana" and "margarine." Of the three, "sana" is least absorbable, but the differences between the two kinds of fat is so small as to be almost negligible.

W. D. H.

Lipase. By A. S. LOEVENHART (*Proc. Amer. Physiol. Soc.*, 1900, xii—xiii. Compare this vol., i, 178).—The degree of activity in any organ is related to the amount of fat transformation taking place there; thus the resting mammary gland possesses but a trace of activity, but when active, its lipolytic power is equal to that of the pancreas. The occurrence of lipase in subcutaneous fat explains why inanition fat is absorbed from this region, and its reversible action accounts for the storage that takes place at other times.

W. D. H.

Metabolism in Forced Feeding. By W. HALE WHITE and E. I. SPRIGGS (*J. Physiol.*, 1901, 26, 151—165).—A full account of the experiment previously recorded (this vol., ii, 28). The deficit of nitrogen in the output is reduced by careful allowance for all possible channels of excretion to 120 grams, or about 5 per cent. of the amount injected, but as some of the increase of weight in the patient was no doubt fat, the correct figure is probably nearer 10. The deficit is perhaps explicable on the assumption that a considerable quantity of simpler nitrogenous substances (creatine, &c.) was formed and retained in the body, and, further, that in overfeeding, the tissues contain less water than in health. If this were so, the figures would come out differently, for the calculations in the paper are made on the assumption that the tissues were normal.

W. D. H.

Influence of Drugs on Hepatic Metabolism. By DIARMID NOËL PATON and J. EASON (*J. Physiol.*, 1901, 26, 166—172).—The

few experiments recorded suggest the following conclusions. Certain drugs (sulphonal, alcohol, carbon monoxide given as coal gas) lessen the amount of waste nitrogen elaborated into the form of urea. Certain other drugs (quinine, morphine) have not this action. The percentage of oxidised sulphur in the urine varies in a corresponding way. The effect is probably related to the activity of liver metabolism. Morphine diminishes the ratio of phosphorus to nitrogen in the urine, whilst carbon monoxide (as coal gas) has not this action.

W. D. H.

The Cause of the Increase of Proteid Decomposition during Inanition. By MARTIN KAUFMANN (*Zeit. Biol.*, 1901, 41, 75—112).—The increase in nitrogenous katabolism often observed during inanition can be prevented in rabbits by giving sugar, and when it does occur it is due to the poorness of the body in proteid-sparing fat.

W. D. H.

The Need for Energy in Animals during Inanition. By ERWIN VOIT (*Zeit. Biol.*, 1901, 41, 113—154).—Rubner's law regarding the energy-need and surface area of animals holds only during rest, when the animal is kept in a mean external temperature and in a normal nutritive condition, but does not hold in comparisons between animals in different nutritive conditions. During inanition, there is no proportion between need of energy and surface area, but the former sinks as the proteid material wastes. If the relationship between energy-need and cell mass is considered as a function of the hunger period, a curve is obtained which, after a short fall, becomes horizontal.

W. D. H.

Influence of Foods on Muscular Work. By H. NEWTON HEINEMANN (*Pflüger's Archiv*, 1901, 83, 441—476). **The Source of Muscular Energy.** By JOHANNES FRENTZEL and FELIX REACH (*ibid.*, 477—508). **Proteid Metabolism and Muscular Work.** By WILHELM CASPARI (*ibid.*, 509—539). **Proteid Feeding and Muscular Work.** By KARL BORNSTEIN (*ibid.*, 540—556). **General Conclusions.** By NATHAN ZUNTZ (*ibid.*, 557—571).—A series of five papers on the much discussed question of the source of muscular energy. Some, like Pflüger, maintain that proteid decomposition is the main source, whilst others attribute it to sugar or other non-nitrogenous materials. Zuntz has shown that the rise of the respiratory quotient, noted by some and regarded by them as a proof that carbohydrate katabolism accounts for the energy produced, does not really occur if all sources of fallacy in method are excluded. Zuntz's own theory is, that any exclusive rôle for any particular class of food substances is incorrect, but allowing for the proteid-sparing action of fats and carbohydrates, the energy-producing power of any variety of food is proportional to its calorific value. Many of the present series of papers traverse the same ground in the discussion of previous work and results, and the final paper by the investigator under whose direction the work has been done is an attempt to coordinate the results, which confirm the theory just stated. The work appears to have been most laborious, extending in many cases to months of observation, and the experimental

results are given with full details. The first two papers deal with results on man on various diets, in the first case using a machine from which the work could be easily calculated, whilst in the second case, walking was the exercise selected. The next two papers deal more with proteid nutrition, the first on dogs, the second on patients undergoing the Weir Mitchell cure with excess of proteid food. They seek to explain the increase of weight, especially in muscle (noted also during athletic training), which occurs in spite of muscular work of an extreme kind.

W. D. H.

Composition and Heat Value of the Muscular Substance from different Animals. By A. KÖHLER (*Zeit. physiol. Chem.*, 1901, 31, 479—519).—The bulk of the paper is occupied with analytical tables of the composition of the muscular tissue of the animals commonly used as food. The elementary composition of this tissue when free from water, ash, and fat does not appear to differ much; the calorific value varies from 5599 to 5677 cal. The fat analyses given were made by Dormeyer's method. The amount of glycogen in horse-flesh is given as 3.58 to 3.72 per cent.

W. D. H.

Does Muscle contain Mucin? By G. A. FRIED and WILLIAM J. GIES (*Proc. Amer. Physiol. Soc.*, 1900, x—xi).—After allowing for alkali-albumin, which is precipitable by acid and soluble in excess, only a faint turbidity suggested traces of mucin.

W. D. H.

Proteids of Unstripped Muscle. By SWALE VINCENT and THOMAS LEWIS (*Proc. Physiol. Soc.*, 1901, xix—xxi).—Rigor mortis, accompanied by slight acidity, occurs in the plain muscle of the stomach, and rectum. Extracts are neutral or alkaline; they contain little or no paramyosinogen, but abundance of myosinogen.

W. D. H.

Effect of Carbon Dioxide and Oxygen on Smooth Muscle. By ALLEN CLEGHORN and H. D. LLOYD (*Proc. Amer. Physiol. Soc.*, 1900, xvi).—Carbon dioxide increases the tissues of smooth muscle from the frog's stomach, but eventually stops the contractions. Recovery was not accelerated by the application of oxygen.

W. D. H.

The Action of Iodine and Iodides on Frog's Muscles. By RALPH STOCKMAN and FRANCIS J. CHARTERIS (*J. Physiol.*, 1901, 26, 277—281).—Iodine, chlorine, and bromine cause rigor mortis and an acid reaction to appear in frog's voluntary muscles; the heart is killed later. The spinal cord and nerves remain excitable so long as the muscles respond. Iodides have also this effect, but chlorides and bromides have it, if at all, only to a very slight degree. After subcutaneous injection, the muscles near the seat of injection are affected first. The iodides of potassium and ammonium have a more powerful action than that of sodium. It is probable that the action is due to liberation of free iodine, and the small effect of chlorides and bromides is due to their being more stable salts. In rabbits, the voluntary muscles are not affected, but the occurrence of lung oedema and pleurisy points to irritation, possibly again due to free iodine.

W. D. H.

Hibernation in Bats. By HECTOR RULOT (*Bull. Acad. Roy. Belg.*, 1901, 17—50).—Although there is absolute loss of water at the end of the winter sleep in bats, there is a proportional increase. Both the absolute and relative weights of fat diminish from the commencement to the end of the winter, especially in the later months. The glycogen follows the same rule, slightly increasing, however, in the last months of the sleep. The amounts of glycogen are throughout so small that this material can hardly be considered to be an important store of material. The consumption of proteid is more marked in the later than in the earlier months, but the relation between the amounts of proteid and fat destroyed rises considerably during April, the last month of the sleep. The sleep is most profound at the beginning of the winter, but the amount of carbon burnt increases from November to April.

W. D. H.

[**Osmotic Phenomena of Red Blood Corpuscles.**] By R. QUINTON (*Compt. rend.*, 1901, 132, 347—350, 432—434).—The non-nucleated red corpuscle offers no resistance to the passage of urea into its protoplasm. The nucleated red corpuscle resists this penetration, and osmotic equilibrium can be established. In this, the nucleated red corpuscle resembles vegetable cells.

W. D. H.

Mechanism of the Action of the [Red] Blood Corpuscles. By PIERRE NOLF (*Ann. Inst. Pasteur*, 1900, 14, 656—685).—The reagents which effect the action of blood corpuscles do so because they increase the affinity of the cell wall for water. The alexins are not proteolytic ferments, but act like the chemical reagents, which cause hæmolysis.

R. H. P.

Blood taken from Animals deprived of their Suprarenals. By ISAAC LEWIN (*Proc. Amer. Physiol. Soc.*, 1900, ix).—The blood of an animal from which the suprarenals have been removed produces when injected intravenously into another animal a rise of blood pressure. Normal blood has no such effect. The substance or substances to which this is due must therefore under ordinary conditions be neutralised by the suprarenals.

W. D. H.

Fibrinolysis. By L. CAMUS (*Compt. rend.*, 1901, 132, 215—218).—If fibrin suspended in salt solution is injected into the peritoneal cavity of rabbits, the serum of the blood is found to have lost its fibrinolytic activity. Injection of serum leads to a corresponding result, but the globulins of the serum do not have this effect. The albumins were not tried. The serum of such immunised animals precipitates solutions of fibrin prepared from the blood of animals of the same kind; this precipitate is redissolved by normal serum.

W. D. H.

Origin of the Alexin of Normal [Blood] Serums. By O. GENGOU (*Ann. Inst. Pasteur*, 1901, 15, 68—84).—Alexin is found in larger quantity in the polynuclear leucocytes than in normal blood serum of dogs and rabbits, whilst the white corpuscles with a single nucleus contain only small quantities. It therefore appears that the

polynuclear leucocytes are the source of the alexin which is found in normal blood serum.

R. H. P.

Action of Chloroform on the Reducing Power of Blood. By M. LAMBERT and LÉON GARNIER (*Compt. rend.*, 1901, 132, 493—495).

—When defibrinated blood is treated with a current of air containing chloroform vapour, the reducing power of the blood is sometimes increased at once, and always after an hour, and this increased reducing power is not due to the dissolution of chloroform in the blood. When, however, defibrinated blood and similar blood containing chloroform are made to circulate respectively through the two lobes of a fresh liver, the glycogen disappears more rapidly in the lobe through which the blood containing chloroform circulates and at the same time the reducing power of this blood increases more rapidly than that of the pure blood, and in a higher degree than corresponds with the glycogen that disappears. It follows that the increased reducing power is not due simply to a more active formation of sugar or to a diminution in its rate of consumption.

C. H. B.

Effect of Ions on the Contraction of the Lymph Hearts of the Frog. By ANNE MOORE (*Amer. J. Physiol.*, 1901, 5, 87—94).

—The rhythmical contractions of the frog's lymph hearts depend on the presence of electrolytes in balanced proportions, for contractions will not take place in solutions of non-conductors after the salts contained in the serum have been washed out. Contractions take place in a pure sodium chloride solution, but continue longer if a definite proportion of calcium chloride, or of some SO_4 compound, is added to the solution. A heart which has been exhausted in sodium chloride may be revived if a small amount of the salt of a bivalent ion is added to the solution.

W. D. H.

Oxydase in Cerebro-spinal Fluid. By E. CAVAZZANI (*Chem. Centr.*, 1901, i, 333; from *Cent. Physiol.*, 14, 473—476).—Cerebro-spinal fluid from dogs and calves gives, after the addition of pyrogallol and sulphuric acid, a crystalline deposit of purpurogallin. The fluid gives with tannic acid a brown, with quinol a rose coloration, and with *o*-toluidine a rose-violet precipitate soluble in ether. From these observations, the existence of an oxidising ferment (cerebro-spinase) is inferred.

W. D. H.

Silicic Acid in Human and Animal Tissues. By HUGO SCHULZ (*Pflüger's Archiv*, 1901, 84, 67—100).—A number of analyses are given which show that silicic acid is found in all forms of connective tissue. Its diminution in diseased conditions has some therapeutic interest.

W. D. H.

Nature of the Sugar Present in Blood, Urine, and Muscle. By FREDERICK W. PAVY and R. L. SIAU (*J. Physiol.*, 1901, 26, 282—290).

—The reducing action of the sugar obtained from blood, urine, and muscle is invariably increased after the action on it of sulphuric acid. It cannot therefore be simply glucose. This conclusion is confirmed by an examination of the osazones obtainable; mixed with glucosazone,

is a variable amount of another osazone which melts at 153—155°. The sugar from which this is derived appears to be *isomaltose*.

W. D. H.

Quantity of Sugar formed in the Animal Organism after Feeding with Various Proteids. By ERNST BENDIX (*Chem. Centr.*, 1901, i, 468—469; from *Arch. Anat. Phys.*, 1900, *Suppl.*, 309—311).—In order to determine how much sugar is formed when certain proteids are used as food, dogs were rendered free from glycogen by depriving them of exercise and excluding all carbohydrates and most proteids from their diet. They were then fed with various proteids, and at the end of half an hour were injected with phloridzin and again when 4 or 5 hours had expired; by this means, the sugar formed in the organism passes at once into the urine. The ratio of the quantity of sugar in the urine to the nitrogen present gives a measure of the amount of sugar formed by the decomposition of the proteid. Casein was found to yield more sugar than ovalbumin, although the former does not form sugar when decomposed by acids, whilst the latter yields it abundantly, and similarly, after feeding with gelatin, the urine contained less sugar than when casein was used. The leucine formed by the decomposition of the albumin in the body is converted into sugar.

E. W. W.

Glycogen in Parasitic Worms. By ERNST WEINLAND (*Zeit. Biol.*, 1901, 41, 69—74).—The amount of glycogen in certain parasitic worms is extraordinarily high, comprising, in *Taenia*, 15 to 47, and in *Ascaris* 20—34 per cent. of the dry substance. On hydrolysis, dextrose is obtained.

W. D. H.

Meat Extract. By JUNG (*Chem. Zeit.*, 1901, 25, 2—3).—The fact that Liebig's meat extract does not readily gelatinise, does not indicate that there is little or no gelatin or its hydrolytic products, gelatoses and glutinpeptone, present, since the presence of other substances, such as mineral salts and organic compounds, influences the ease with which a gelatin solution sets.

Gelatin gives Millon's reaction (compare Mörner, *Abstr.*, 1900, i, 128).

The presence of appreciable amounts of albumoses in meat extract is disproved; the total amount of albumose, albumin, and unaltered gelatin is not more than 0.94 per cent.

J. J. S.

Curdling by Rennet. By J. J. OTT DE VRIES and F. W. J. BOEKHOUT (*Landw. Versuchs-Stat.*, 1901, 55, 221—239. Compare Söldner, *Abstr.*, 1889, 634).—The authors criticise Söldner's results and conclusions, and from results obtained with milk which will not curdle, draw the conclusion that soluble calcium salts cannot have the importance which Söldner ascribes to them. Practically no calcium is rendered insoluble when milk is boiled. Addition of soluble calcium salts introduces complications, as some of the calcium enters into combination, and the acidity of the milk is increased. Söldner's view that the favourable effect of acidity on curdling is due to calcium being dissolved is incorrect. When the carbon dioxide is removed from boiled milk, previously saturated with the gas, the amount of soluble calcium

salts remains constant, but the milk becomes incapable of being curdled.
N. H. J. M.

Composition and Action of Orchitic Extracts. By WALTER E. DIXON (*J. Physiol.*, 1901, 26, 244—273).—Extracts of testis made with physiological saline solution contain (1) proteid, mainly nucleo-proteid, (2) organic substances unaltered by boiling, and (3) inorganic salts present in the dried ram's testis to the extent of 7·5 per cent. The physiological effects of injecting the extract are mainly due to the organic materials. The blood pressure falls after a somewhat lengthy latent period, and is chiefly produced by cardiac inhibition; the respiration ceases during inhibition of the heart; recovery is gradual. There is dilatation of the splanchnic, splenic, and testicular blood vessels, but constriction of the kidney vessels; this effect is probably due to action on the vaso-motor centre. Both cardiac and respiratory effects are abolished by sections of the vagus-nerves, and are probably produced reflexly. Hypoleucocytosis followed by hyperleucocytosis is another effect. These effects are mainly due to nucleo-proteid, but intravascular clotting was not observed. The substances not altered by boiling are leucomaines allied to choline, and spermine is also present; these appear to be chiefly derived from the metabolism of the glandular epithelium of the testicular ducts.
W. D. H.

Substances which Lower Blood-pressure in Suprarenal Extracts. By REID HUNT (*Proc. Amer. Physiol. Soc.*, 1900, vi—vii).—Choline is present in extracts of suprarenal glands, but there appears to be something else as well that lowers blood pressure. This second substance lowers blood pressure after the administration of atropine. On treatment of extracts with certain reagents, the amount of choline increases. This parent substance of choline is not lecithin or jecorin, but is possibly a choline ester. Similar results were obtained with brain extracts.
W. D. H.

Intravenous Injection of Minimal Doses of Epinephrine Sulphate. By REID HUNT (*Proc. Amer. Physiol. Soc.*, 1900, vii—viii).—Such small doses as 0·083 millionth of a gram of Abel's epinephrine sulphate will produce a rise of blood-pressure. It is thus many times more powerful physiologically than crude aqueous extracts of suprarenal.
W. D. H.

Excretion of Kynurenic Acid. By LAFAYETTE B. MENDEL and E. C. SCHNEIDER (*Proc. Amer. Physiol. Soc.*, 1900, ix—x).—The experiments recorded confirm the work of Mendel and Jackson, that kynurenic acid is not the result of intestinal putrefaction, but of proteid metabolism. It occurs in dog's urine after a six days' fast, and a large dose of calomel, and at a time when no ethereal sulphates are present. Feeding with gelatin, elastin, ovo-mucoid, chondrin, and thymus powder does not, however, produce an output of the acid.
W. D. H.

Oxidation Relationships of Urine Components. By ADOLF JOLLES (*Chem. Centr.*, 1901, i, 467—468; from *Ber. klin. Woch.*, 37, No. 51).—When barium chloride is added to acidified or to neutral

urine, the precipitate in both cases contains organic compounds. The quantity of potassium permanganate which is reduced by these precipitates has been determined. The precipitate obtained from the urine of healthy persons was found to require 0.198—0.243 gram of oxygen per litre, whilst that formed after acidifying the urine only required 0.079—0.096, that is, the former quantity is usually 2 to 3 times as great as the latter. In a number of diseases, the oxygen used to oxidise the precipitate from the neutral solution rose to 0.325 gram whilst that required for the precipitate from the acid solution varied from 0.052 to 0.170 gram.

E. W. W.

Ehrlich's Dimethylaminobenzaldehyde Reaction. By FR. PRÖSCHER (*Zeit. physiol. Chem.*, 1901, 31, 520—526).—The constituent of urine which gives the red coloration with dimethylaminobenzaldehyde is not one of the compounds which have so far been isolated, and is contained in larger quantity in the urine of patients suffering from typhus, phthisis, and chronic enteric fever. The red compound has the composition $C_{16}H_{24}O_6N_2$; it forms a dust-red powder soluble in alcohol, chloroform, acetic acid, epichlorohydrin, or dichlorohydrin. It also dissolves in alkalis and yields an amorphous brown precipitate with alcoholic picric acid. The constituent of urine which gives rise to the red compound probably has the composition $C_7H_{15}O_6N$.

J. J. S.

Chemistry of Nerve Degeneration. By WILLIAM D. HALLIBURTON and FREDERICK W. MOTT (*Proc. Physiol. Soc.*, 1901, xxv—xxvi).—In the disease general paralysis of the insane, the marked degeneration that occurs in the brain is accompanied by the passing of the products of degeneration into the cerebro-spinal fluid. Of these, nucleo-proteid and choline can be most readily detected. Choline can also be found in the blood. This is not peculiar to the disease just mentioned, but in various other degenerative nervous diseases (combined sclerosis, disseminated sclerosis, alcoholic neuritis, beri-beri) choline can also be detected in the blood. The tests employed to detect choline are mainly two: (1) the obtaining of the characteristic octahedral crystals of the platinichloride from the alcoholic extract of the blood; (2) the lowering of blood-pressure (partly cardiac in origin, and partly due to dilatation of peripheral vessels) which a saline solution of the residue of the alcoholic extract produces: this fall is abolished, or even replaced by a rise of arterial pressure, if the animal has been atropinised. It is possible that such tests may be of diagnostic value in the distinction between organic and so-called functional diseases of the nervous system. The chemical test can frequently be obtained with 10 c.c. of blood.

A similar condition was produced artificially in cats, by a division of both sciatic nerves, and is most marked in those animals in which the degenerative process is at its height as tested histologically by the Marchi reaction. A chemical analysis of the nerves themselves was also made. A series of cats was taken, both sciatic nerves divided, and the animals subsequently killed at intervals varying from 1 to 106 days. The nerves remain practically normal as long as they remain irritable, that is up to 3 days after the operation. They then

show a progressive increase in the percentage of water, and a progressive decrease in the percentage of phosphorus. The phosphorised fat entirely disappears when degeneration is complete. When regeneration occurs, the nerves return approximately to their previous chemical condition. The chemical explanation of the Marchi reaction appears to be the replacement of phosphorised by non-phosphorised fat. When the Marchi reaction disappears in the later stages of degeneration, the non-phosphorised fat has been absorbed. This absorption occurs earlier in the peripheral nerves than in the central nervous system.

This confirms previous observations on the spinal cord in which unilateral degeneration of the pyramidal tract by brain lesions produced an increase of water and a diminution of phosphorus in the degenerated side of the cord, which was stained by the Marchi reaction.

The Marchi reaction (the black staining produced by a mixture of Müller's fluid and osmic acid) is given by ordinary fat as contained in adipose tissue.

W. D. H.

Physiological and Toxicological Effects of Tellurium Compounds. By L. D. MEAD and WILLIAM J. GIES (*Amer. J. Physiol.*, 1901, 5, 104—149).—Non-toxic doses of tellurium (as oxide, tellurite, tartrate, and tellurate) do not materially affect metabolism in dogs. They appear to stimulate katabolism, and diminish fat absorption slightly; the urine is rendered dark brown. Large doses retard digestion, and induce vomiting and somnolence. They cause enteritis. Subcutaneously injected, they cause diarrhœa, tremors, and death from asphyxia. At the point of injection, tellurium is deposited in the metallic form, and is distributed in most of the organs and tissues. Methyl telluride appears in the breath a few minutes after the introduction of quite small amounts of tellurium into the system. It persists for months, slowly leaving the body, by skin, lungs, urine, bile, and fæces. Of the digestive ferments, trypsin is the least resistive to the destructive influence of the metal. Albumin and bile pigment are usually present in the urine.

W. D. H.

Increase of Proteid Decomposition by Protoplasmic Poisons, especially Chloroform Water in Herbivora. By OTTO ROSTOKI (*Zeit. physiol. Chem.*, 1901, 31, 432—445).—When given in large doses, protoplasmic poisons like chloroform water cause in herbivorous, as in carnivorous, animals an increase of nitrogen output. This lasts for some days. Sometimes a preliminary fall in the excretion of nitrogen occurs. The increase of nitrogen is due to increase of urea. In rabbits, the amount of sulphur in the urine depends in great measure on the food.

W. D. H.

Behaviour of *d*-Gluconic Acid in the Organism. By PAUL MAYER (*Ber.*, 1901, 34, 492—494).—Rabbits oxidise sodium gluconate completely when it is administered to them internally. On the other hand, when this salt, or the free acid, is injected subcutaneously, part of it is oxidised to *d*-saccharic acid, which appears in the urine of the rabbits.

C. F. B.

Chemistry of Vegetable Physiology and Agriculture.

Physics of Fermentation. By EUGEN PRIOR and H. SCHULZE (*Zeit. angew. Chem.*, 1901, 14, 208—215).—Quantitative experiments on the fermentation of mixtures of dextrose and levulose, and of maltose and dextrose by yeast cells, are described. These support the authors' views that the process of fermentation takes place inside the yeast cell, that it is dependent on the diffusion of the sugar solution through the cell wall, that the rate of diffusion through the cell wall varies for different species of yeast cells, and that in a mixture of sugars the amount of each which is fermented by yeast cells varies with the osmotic pressure of each sugar. R. H. P.

Influence of Carbon Dioxide on Fermentation [of Sucrose]. By HUGO ORTLOFF (*Centr. Bakt. Par.*, 1900, [ii], 6, 676—682, 721—733, and 753—763).—The influence of the presence of an excess of carbon dioxide has been investigated with the following results. (1) It increases the inverting power of some species of yeast, but decreases that of others. (2) It hinders the fermentation of dextrose. (3) It decreases the yield of alcohol, not only absolutely, but also relatively to the amount of sucrose fermented. (4) It has no influence on the formation of acids. (5) It decreases the "energy of multiplication," as measured by the number of cells after four days' fermentation. (6) It decreases the "power of multiplication," as measured by the number of cells at the end of the fermentation. (7) It diminishes the "energy of fermentation," as measured by the quantity of sucrose fermented in four days. (8) It, however, considerably increases the "fermenting power" as measured by the quantity of sucrose fermented in 28 days by one million cells.

Single cells produce more alcohol and more acid, when fermentation takes place in the presence of an excess of carbon dioxide than under ordinary conditions. The net result is that the fermentation is decreased, but the fermenting power increased, by the presence of an excess of carbon dioxide. R. H. P.

Enzymes. By W. ISSAEW (*Chem. Centr.*, 1901, i, 405; from *Zeit. ges. Brauw.*, 23, 796—799).—I. Malt glycase.—The most favourable temperature for the formation of dextrose in mashing is 52—60°. Malt dried at the temperature of the air yielded 2.25, light malt 1.71, and dark malt 1.30 grams of dextrose per 100 c.c. of extract, prepared by treating 100 grams of malt with 400 c.c. of water for 4 hours. The dextrose must be formed by the fermenting action of insoluble portions of the malt; even if a soluble enzyme is present, it can only play a very small part in the process.

II. Invertin.—Solutions of invertin prepared by extracting more or less plasmolysed yeast with water by Lintner's method (*Abstr.*, 1900, ii, 296) are quite as active as extracts obtained from the dried

yeast. The solubility of the invertin is not increased by adding more than 10—15 per cent. of sucrose, although the extract then contains a larger amount of substances which are coagulated on heating. By prolonging the process of plasmolysis and fermentation beyond 24 hours, the speed of inversion is affected, but the limit attained is the same. The solution obtained by extracting for 6 days at 36°, or by treating the fresh yeast with water for 24 hours, is weaker than that prepared from the yeast by 24 hours' plasmolysis followed by 24 hours' fermentation. Top fermenting yeasts contain much less invertin than bottom yeasts.

E. W. W.

Fermentation Experiments with various Yeasts and Sugars.

By PAUL LINDNER (*Chem. Centr.*, 1901, i, 404; from *Woch. Brau.*, 1900, 17, 762—765. Compare this vol., ii, 182).—The action of bottom yeasts on inulin, dextrin, trehalose, melibiose, and α - and β -methylglucosides has also been investigated. Dextrin was only strongly fermented by one yeast; trehalose and α -methylglucoside gave very varying results. Inulin was decomposed by all the yeasts except two, whilst β -methylglucoside was not attacked by any. Except in a few doubtful cases, melibiose was fermented by all the yeasts. A solution of melibiose does not, however, afford a trustworthy means of distinguishing between top and bottom yeasts.

A group of wild yeasts obtained from breweries which used bottom fermenting yeasts gave the following results. Dextrin was attacked by some, but not by others, whilst raffinose was fermented by all the yeasts which fermented melibiose, but only moderately or slightly by the rest. In the case of α -methylglucoside, three yeasts gave doubtful results, and with two others there was no action. Inulin was slightly fermented by four yeasts, but generally remained intact. Trehalose was rather strongly attacked by most of the yeasts, but doubtful results were obtained with two, and in three cases it was not affected. Generally speaking, the sugars were not attacked by torula and red yeasts, but dextrose and lævulose were decomposed by two kinds.

The mixture of *l*-sorbose and *d*-galactose referred to in the previous paper (*loc. cit.*), proved to be *l*-sorbose prepared from *d*-galactose, and the ψ -tagatose was also found to be *l*-sorbose.

E. W. W.

Intracellular Nutrition of Yeast. By E. KAYSER (*Ann. Inst. Pasteur*, 1900, 14, 605—631).—The acidity produced in fermentation by yeast and caused by volatile and fixed acids is dependent on the nature of the medium and the conditions of the fermentation. The presence of acetic acid or peptone decreases the amount of fixed acids, but both fixed and volatile acids are increased in quantity by the presence of phosphates. The amount of aeration also has an effect on the relative quantity of fixed and volatile acids formed in the fermentation.

R. H. P.

Occurrence and Disappearance of Glycogen in Yeast Cells. By RICHARD MEISSNER (*Centr. Bakt. Par.*, 1900, [ii], 6, 517—525, 545—554).—The fermentation of sugar by yeast cells is accompanied by the disappearance of glycogen from the cells. The cells contain the glycogen in largest quantity when the fermenting liquid contains

about 5·5 per cent. of alcohol; the glycogen then disappears with more or less rapidity, according to the species of yeast used. Glycogen first appears in the young cells when they have attained a diameter about one-fifth of that of the parent cell. The glycogen appears to be decomposed and reformed as soon as fermentation begins; when the yeast experiences a want of sugar, the formation of glycogen ceases. Thus glycogen can be looked on as a "transitory reserve material."

R. H. P.

Experiments with Bacteria decomposing Carbamide, with the object of the Accumulation of one Variety. Decomposition of Carbamide by Urease, and by Katabolism. By MARTINUS W. BEYERINCK (*Centr. Bakt. Par.*, 1901, [ii], 7, 33—61).—The object of the investigations here described was to accumulate that variety of bacteria in a mixture, which was best adapted to the conditions of the experiment. In some cases, the experiments only resulted in the relative increase of one variety, whilst in others one variety accumulated, and the rest completely disappeared. Bacteria which decompose carbamide are of two kinds, of which one kind brings about the decomposition by means of *urease*, an enzyme insoluble in water, and the other (some phosphorescent species) by direct contact with the living protoplasm, a process which the author terms "katabolism." These two methods of decomposing carbamide are distinguished by the temperature at which the maximum decomposition takes place, the katabolic decomposition being at its maximum at the most favourable temperature for the growth of the micro-organisms, whilst the decomposition produced by urease is at its maximum at a much higher temperature.

R. H. P.

Behaviour of Denitrifying Bacteria in Culture Solutions. By ALBERT STUTZER (*Centr. Bakt. Par.*, 1901, [ii], 7, 81—88. Compare Abstr., 1900, ii, 494).—A confirmation of Jensen's results (Abstr., 1900, ii, 232, 495) and a continuation of the author's work (see Abstr., 1900, ii, 97, 359).

R. H. P.

Bacteria producing Lactic Acid and their Importance in the Ripening of Cheese. By ROBERT CHODAT and N. O. HOFMAN-BANG (*Ann. Inst. Pasteur*, 1901, 15, 36—48).—The action was investigated on casein of tyrothrix and of bacteria, isolated from Emmenthaler cheese, which produce lactic acid. The bacteria did not decompose the casein, even after it had been partly dissolved by the tyrothrix. This result is not in accordance with the views of Freudenreich, who holds that the bacteria which produce lactic acid play the greater part in the ripening of cheese (Abstr., 1900, i, 712); compare also Epstein, this vol., ii, 119).

R. H. P.

Bacillus Carotovorus, the Cause of a White Rot of Carrots. By LEWIS RALPH JONES (*Centr. Bakt. Par.*, 1901, [ii], 7, 12—21, and 61—68).—The organism which causes the rotting of carrots is not the same as that which affects turnips. *Bacillus carotovorus* is motile, does form spores, liquefies gelatin, produces at first an acid but after-

wards an alkaline reaction in meat broth, curdles milk, is a facultative anaerobe, and will convert nitrates into nitrites. R. H. P.

Modification of the Functions of *Bacillus Coli*. By LÉON GRIMBERT and G. LEGROS (*J. Pharm.*, 1901, [vi], 13, 107—109).—Attempts made to deprive *Bacillus coli* of its characteristic functions, by cultivation under various abnormal conditions, resulted in two only out of five different types being deprived of their power to produce indole, whilst in no case was their power to ferment lactose destroyed. H. R. LE S.

Reduction of Sulphates in Brackish Water by Bacteria. By R. H. SALTET [and C. S. STOCKVIS] (*Centr. Bakt. Par.*, 1900, [ii], 6, 648—651, 695—703. Compare Beyerinck, this vol., ii, 120).—The reduction of sulphates to hydrogen sulphide in brackish water takes place in at least two stages: the sulphates are partially reduced to sulphites or other oxygenated sulphur compounds by *Bacillus desulfuricans* and these are afterwards reduced to hydrogen sulphide by other species of bacteria. R. H. P.

Biology and Chemistry of Diphtheria Bacilli. By HANS ARONSON (*Chem. Centr.*, 1901, i, 471—472; from *Arth. Kinderheilkunde*, 30).—When diphtheria bacilli from which the fat has been removed by ether and alcohol are treated with dilute sodium hydroxide solution by H. Kossel's method, the solution obtained contains only a small quantity of the poisonous substance, and thus differs entirely from the extract prepared by means of a 0.1 per cent solution of ethylene-diamine. Since the solution of the toxin is little affected by treating with alcohol and ether, it cannot be an albumin. The precipitate formed when acetic acid is added to the filtrate contains a large quantity of the poisonous substance. By treating the bacilli freed from fat with a dilute solution of alkali, first at the ordinary temperature, then at 100°, and finally under pressure at 130°, extracts are obtained from which acetic acid precipitates substances which give the reactions of albumin. The white powder prepared by repeated purification of the precipitates is not separated from its solutions in alkalis by acetic acid and is a nucleic acid corresponding with Ruppel's tuberculinic acid (*Abstr.*, 1899, ii, 237) but is not identical with it. By heating with hydrochloric acid the substance obtained by means of acetic acid, xanthine bases and pentoses are formed, hence it not only contains albumin but also nucleoproteids. No characteristic toxin could be detected in the diphtheria bacilli. The fat extracted from the bacilli is very deliquescent. The mass left after completely extracting the bacilli with alkali contains a carbohydrate which almost completely dissolves on boiling with a 1 per cent. solution of hydrochloric acid; the filtrate reduces Fehling's solution, is dextrorotatory, and yields an osazone. This carbohydrate is neither cellulose nor chitin. E. W. W.

Morphology of the Organisms Designated "*Bacterium Radicicola*." By ALBERT STUTZER (*Bied. Centr.*, 1901, 30, 60—63; from *Mitt. Landw. Inst. k. Univ. Breslau*, 1900; *Heft*, 3, 57).—Extracts of green leguminous leaves, with or without addition of agar,

are very suitable for cultivating *Bacterium radicola*, but all attempts to obtain the branched forms failed when neutral or slightly alkaline media were employed.

Later experiments in which small amounts of organic acids (0.05 per cent.) were added to the solutions previously employed showed a production of the branched forms. Potassium phosphate is a necessary constituent, and magnesium sulphate favours the production of good forms of growth: sodium, calcium, and iron, &c., are without influence, Dextrose (1 per cent.) is favourable, as are also inulin and starch meal, whilst gum arabic, sucrose, lævulose, molasses, and lactose are less favourable. Peptone alone was found to be equal to asparagine, and is perhaps more favourable to the production of branched forms than asparagine. The frequent use of fresh acid solutions increases the number of branched forms.

Branching also takes place in solutions containing dextrose, asparagine, magnesium sulphate, and potassium dihydrogen and dipotassium hydrogen phosphates (but without organic acid). The best results were obtained when the solution contained potassium dihydrogen phosphate (1 per thousand) or the monopotassium salt, 0.75, and dipotassium salt, 0.25 per thousand.

N. H. J. M.

Formation of Solanine in Potatoes as a Product of Bacterial Action. By RICHARD WEIL (*Arch. Hygiene*, 1900, 33, 330—349).—Some potatoes were found to contain as much as 0.38 per cent. of solanine. From the grey spots on these, and the portions of the potato immediately surrounding them, thirteen species of bacteria were isolated; of these, two, *Bacterium solaniferum non colorabile* and *B. solaniferum colorabile* cause the formation of solanine when cultivated on potatoes.

R. H. P.

Chemistry of Bacteria. By ERNST BENDIX (*Chem. Centr.*, 1901, i, 406—407; from *Deutsch. med. Woch.*, 27, 18—19).—A pentose has been obtained from tuberculosis bacilli by boiling the dried bacilli with a 5 per cent. solution of hydrochloric acid. The solution reduced alkaline copper solutions, gave the characteristic orcinol hydrochloric acid reaction and with phenylhydrazine formed an osazone which melted at 153—155°. The pentose was found to be contained in the nucleo-proteids of the bacilli. A mixture of faecal bacteria cultivated in urine and the bacilli of diphtheria both showed the pentose reactions, but the bacilli of typhus gave negative results.

E. W. W.

Germination in Distilled Water. By PIERRE DEHÉRAIN and DEMOUSSY (*Compt. rend.*, 1901, 132, 523—527. Compare Boehm, *Ann. Agron.*, 1875, i, 470; Dehérein, *ibid.*, 1878, 4, 321, and Dehérein and Bréal, *ibid.*, 1883, 9, 58).—Germinating seeds form roots, and begin their evolution, in water quite free from calcium, but the development of roots in distilled water is checked by very slight traces of copper (compare Coupin, *Abstr.*, 1899, ii, 118). Fungi, algæ, and germinating vegetable seeds show the presence of traces of a metal, such as copper, which cannot be detected by means of the reactions usually employed.

N. H. J. M.

Behaviour of the Pentosans of Seeds during Germination.

By A. SCHÖNE and BERNHARD TOLLENS (*Chem. Centr.*, 1901, i, 467; from *Diss.*, 1899, *Rostock*).—The percentage of pentosans contained in barley, wheat, and peas was found to be greater after germination than before, and a slight increase in the total quantity was also observed in each case. The new pentosans are probably derived from the starch, and the pentosans cannot therefore be regarded as reserve nutritive material which disappears during respiration. E. W. W.

Physiological Function of Enzymes in Vegetable Life.

By MARCO SOAVE (*Bied. Centr.*, 1901, 30, 29—32; from *Staz. Sper. Agrar. Ital.*, 1899, 32, 553).—In experiments with seeds of *Arachis hypogaea*, it was found that chloroform and ether hindered germination, but did not kill the seedlings. In the case of ether, the chemical changes were scarcely affected. N. H. J. M.

Composition of the Cocoa-nut during Germination.

By J. E. KIRKWOOD and WILLIAM J. GIES (*Proc. Amer. Physiol. Soc.*, 1900, xiv—xv).—A tabular statement, giving water, solids, ash, and nitrogen in different parts of the cocoa-nut at various stages of its growth. The cotyledon, especially the central nerve vascular portion, contains a considerable amount of diastatic ferment, and a trace of proteolytic enzyme. Enzymes which dissolve cellulose and hydrolyse fats were not found. W. D. H.

Assimilation of Carbon Dioxide by Hyphomicrobium and Nitromicrobium.

By ALBERT STUTZER (*Bied. Centr.*, 1901, 30, 58—60; from *Mitt. Landw. Inst. K. Univ. Breslau*, 1900, Heft 3, 36).—In inorganic solutions, hyphomicrobium only developed satisfactorily in presence of free carbon dioxide; addition of mannitol or sodium lactate did not affect the result.

Similar results were obtained with nitromicrobium; mannitol had no effect. N. H. J. M.

Influence of Pressure on Chlorophyllous Assimilation.

By JEAN FRIEDEL (*Compt. rend.*, 1901, 132, 353—355. Compare Abstr., 1900, ii, 679).—The diminution of the total pressure alone tends to further assimilation. The isolated action of the pressure of carbon dioxide, and the isolated action of the total pressure, are both modified, and in a different manner, by the amount of carbon dioxide present in the air. These modifications are, however, such that the resulting phenomenon follows the same law within fairly wide limits. When air containing carbon dioxide is simply rarefied, assimilation is first reduced to a minimum and then increases to a maximum.

N. H. J. M.

Reserve Carbohydrate in the Root Swellings of Arrhenatherum bulbosum.

By V. HARLAY (*Compt. rend.*, 1901, 132, 423—426).—In preparing the carbohydrate, methods similar to those described by Ekstrand and Johanson (*Abstr.*, 1888, 246 and 439), by Müntz, and by Bourquelot and Hérissé (Abstr., 1900, ii, 301, and *J. Pharm.*,

1900, [vi], 11, 589) were employed. The substance very much resembles phléin and graminin (Ekstrand and Johanson, *loc. cit.*), its melting point (212°) and rotatory power ($\alpha_D - 44.7^{\circ}$) being between those of the latter carbohydrates; it also differs from inulin by its greater solubility.

The carbohydrate, which the author also terms graminin, is not altered by saliva or by diastase, but was partially (one-twelfth) converted into sugar by 20 hours' contact with the ferments secreted by *Aspergillus niger*. The same result was obtained by the action of the root sap of *Arrhenatherum bulbosum*, whilst the sap from the green portions of the plants had no action.

The fresh root swellings contain 7.5 per cent. of graminin; lævulose, and perhaps dextrose, also seem to be present. N. H. J. M.

Catha edulis. By ALBERT BEITTER (*Arch. Pharm.*, 1901, 239, 17—33).—*Catha edulis* is a shrub which is cultivated in Abyssinia and Arabia, and is consumed largely by the inhabitants of those regions, being either chewed or taken as an infusion. It acts as a stimulant, inducing wakefulness at the same time; its use in Eastern Africa is on a level with that of tea, coffee, and alcohol in Europe.

The leaves were extracted with chloroform containing ammonia, the extract was evaporated, and the residue extracted with very dilute hydrochloric acid. From the acid extract, a crystalline *alkaloid* was separated with great difficulty, but the amount obtained was so small that no satisfactory analysis could be made. The composition, however, corresponds approximately with that required by the formula $C_{10}H_{18}ON_2$; the basic character of the alkaloid is fairly pronounced, and crystalline salts, namely, *acetate*, *sulphate*, *hydrochloride*, *hydrobromide*, and *salicylate*, were prepared, although not analysed. The residue, after extraction of the alkaloid with acid, was purified by dissolving it repeatedly in chloroform and precipitating it with alcohol; it has approximately the composition $C_{10}H_{17}O$, is completely melted at 120° , and has the properties of caoutchouc. By extracting the leaves, already exhausted with chloroform, with water, and precipitating with lead acetate, a *tannin* is obtained very similar to that of tea. The filtrate from the lead precipitate was found to yield mannitol, the presence of which was suspected by Schorlemmer (*Chem. News*, 1883, 48, 225). By distilling the chopped leaves with superheated steam, a very small quantity of an *essential oil* is obtained, probably containing oxygen. The seeds contain 51 per cent. of a *fatty oil* which consists of the glycerides of fatty acids, and has the Hübl number 103.9. The ash contains magnesium, calcium, and iron, combined with chlorine and carbonic, sulphuric, and a trace of sulphurous acids. C. F. B.

Large yield of Manna by Olive Trees. By J. A. BATTANDIER (*J. Pharm.*, 1901, [vi], 13, 177—179).—Details of the chemical examination of manna, a summary of which has already appeared (Trabut, this vol., ii, 184). H. R. LE S.

Chemistry of Rhubarb. By CARL G. HUNKEL (*Pharm. Arch.*, 1900, 3, 201—216).—A *phenolic* substance, $C_{10}H_{10}O_4$ or $C_{12}H_{11}O_5$, was

obtained, softening at 172—173° when heated, and unstable in character. Sucrose was isolated in a crystalline state, and some evidence of the presence of dextrose was obtained. In other respects, the results obtained do not seem to add much to what was known already.

C. F. B.

Manufacture of Wine. IV. Soluble Constituents of Vine Leaves. By CARL BOETTINGER (*Chem. Zeit.*, 1901, 25, 6—8, 17—18, 24—25).—The aqueous extract of vine leaves gathered at the end of July contains calcium and potassium hydrogen tartrates, and alkali phosphates, together with a small amount of a sugar which may be isolated in the form of an osazone melting at 205—206°.

The alcoholic extract contains tartaric, succinic, and pyrocatechuic acids, together with other products not yet identified.

J. J. S.

Water Chesnut (*Trapa natans*, L.). By ALEXANDER ZEGA and DOBR. KNEZ-MILOJKOVIĆ (*Chem. Zeit.*, 1901, 25, 45. Compare Neumann, *Abstr.*, 1899, ii, 794).—The following are the results of analysis of I, the kernel; and II, the shell:

	Water.	N com- pounds.	Fat.	Carbo- hydrates.	Woody tissue.	Ash.	P ₂ O ₅ .
I.	37.19	10.34	0.71	48.99	1.36	1.41	—
II.	39.71	8.04	0.80	48.94	1.27	1.24	0.56

The nut is largely used as a food, both green and ripe. In the uncooked state, it tastes somewhat like the chesnut.

J. J. S.

Mercurial Poisoning of Green Plants. By FRANZ W. DAFERT (*Chem. Centr.*, 1901, ii, 331—332; from *Zeit. landw. Versuchs-Wes. Oesterr.*, 4, 1—9).—By placing the plants in a bell-jar standing over mercury, it has been found that barley, wheat, rye, oats, red clover, *Picea vulgaris*, *Aster chinensis*, *Sinapis alba*, and *Verbena officinalis* are all sensitive to the action of a very small quantity of mercury vapour, which prevents growth and causes the death of the portions of the plant which contain chlorophyll. In most cases, there are no characteristic symptoms of poisoning, but when the air enters through a very small mercury valve, such symptoms are exhibited under certain conditions. The young plants are more easily affected than the older ones, and mustard and barley are the most quickly attacked. In the case of plants which are affected by the moisture in the air, the poisonous action is most marked when the air is the most humid.

When the mercury is covered with a layer of glycerol, the plants remain without injury.

E. W. W.

[Pot Experiments on the Action of Sodium Iodide and Bromide, and Lithium Chloride on Crops.] By J. AUGUSTUS VOELCKER (*J. Roy. Agr. Soc. Engl.*, 1900, [iii], 11, 566—591).—The object of the experiments was to ascertain the effect of the rarer ash constituents of plants when applied as manures. The present report contains the results obtained in 1898 and 1899.

Sodium iodide, at the rate of 200 cwt. per acre, killed wheat, barley, and red clover; peas were slightly benefited. When applied at the rate

of 1 cwt. per acre, sodium iodide injured both wheat and barley. A top dressing of $\frac{1}{2}$ cwt. was injurious to wheat and barley. Soaking the seeds in 1 per cent. iodide solution increased the yield of wheat and barley, grain and straw, and benefited the red clover.

Sodium bromide, 100 or 200 cwt. per acre, or $\frac{1}{2}$ cwt. top-dressed, very greatly reduced the yield of wheat, but the effects on barley were not so marked. The effects of 200 cwt. or smaller amounts, on red clover were injurious rather than beneficial. Soaking seeds with 1 per cent. of sodium bromide was more or less beneficial in each case. Lithium chloride (500 cwt.) at first retarded the growth of wheat, which, however, subsequently grew fairly well; the effect on barley was similar, whilst mustard failed and peas germinated badly. Smaller amounts (200 cwt.) slightly benefited peas. Sodium iodide and bromide rendered the soil impervious, and the iodide pots gave off an odour of iodine.

A water-culture experiment is described in which wheat was grown without and with sodium iodide (I=1:43,700); photographs of the roots show that those of the plants grown under the influence of iodide were quite dwarfed. The total air-dried plants weighed 0.277 gram without, and 0.141 gram with, sodium iodide.

N. H. J. M.

[Pot Experiments on Wheat and Barley.] By J. AUGUSTUS VOELCKER (*J. Roy. Agr. Soc. Engl.*, 1900, [iii], 11, 594—603).—Results of comparative experiments with large and small seeds (wheat and barley) indicated that the size of the seed does not have much effect on the yield or on the weight of the seed produced. Climatic conditions at the ripening period are more probably the determining factors.

As regards the question of the production of hard or soft wheat, it was found that the sowing of either kind does not necessarily result in the production of wheat of the kind sown. Besides the character of the season at the time of ripening, it is shown that the nature of the soil is of importance. Heavy soil on which soft wheat was sown produced only hard wheat.

Ears which were at all blighted were always glutinous and never starchy. Experiments were made on the effect of different materials on "smutty" wheat. Hot water, copper sulphate, potassium sulphide, and a mixture containing copper sulphate and carbolic compounds were tried. All the applications were very beneficial, but treatment with hot water (not exceeding 133° F.) was as effectual as any.

N. H. J. M.

Use of Sodium Nitrate containing Perchlorate. By J. AUGUSTUS VOELCKER (*J. Roy. Agr. Soc. Engl.*, 1900, [iii], 11, 603).—Sodium nitrate free from perchlorate, and also a sample containing 2.15 per cent. of perchlorate, were applied at the rate of 1 cwt. per acre to barley grown in pots. The perchlorate had no injurious effect on the growth of barley, and the weight of grain and straw were equal to that obtained with pure sodium nitrate.

Difficulty was experienced in obtaining sodium nitrate containing perchlorate in appreciable quantity.

N. H. J. M.

Cultivation of Leguminous Plants. By L. MALPEAUX (*Ann. Agron.*, 1901, 27, 65—81).—Germination experiments made with

various leguminous seeds showed that addition of sodium nitrate (1·5 grams to 10 kilograms of sand) is injurious, especially in the case of lucerne and incarnate clover (compare Claudel and Crochetelle, *Abstr.*, 1896, ii, 442).

Sodium nitrate was found to be slightly beneficial when applied to young plants grown in sand, but rather retarded growth in ordinary soil except in the case of peas. Nodules are formed on the roots in a comparatively short time; they were found on lupin roots in 12 days, on haricot roots in 14 days, and on pea roots only after 22 days.

Nodules are nearly always formed on the roots of leguminous plants, the necessary bacteria being carried by wind or by birds; the absence of nodules indicates that the soil is unfavourable to the development of the bacteria.

Nitric nitrogen seems to be directly assimilated by the *Leguminosæ* and may cause complete absence of root-nodules. The conclusion is drawn that manuring with nitrate is quite useless for leguminous crops.

N. H. J. M.

Cultivation of Gorse. By HENRI GUÉPIN (*Ann. Agron.*, 1900, 27, 106—107; from *J. Agr. Prat.*, 1899, ii, 661. Compare Girard, this vol., ii, 187).—Gorse requires neither nitrogen nor lime, but is benefited by phosphates and especially by potash. The crop may be cut every year from the second year, and lasts about seven years. The yield is estimated at 30,000 to 40,000 kilos., corresponding with 15,000 kilos. of hay.

N. H. J. M.

Gorse as Food for Sheep. By J. AUGUSTUS VOELCKER (*J. Roy. Agr. Soc. Engl.* 1899, [iii], 10, 567—573)—The gorse was sown in May, 1897, between alternate rows of barley, on some very poor sandy soil at Woburn. No manure was applied. The yield of gorse cut at the end of 1898 was 11 tons per acre.

Feeding experiments with sheep were instituted to ascertain in the first place how far gorse can be employed as a substitute for roots.

It was found that 2·5 lbs. of gorse was the greatest amount consumed per day (corresponding with about 6 lbs. of roots). The gorse proved, however, to be decidedly beneficial, as regards the general health of the sheep, the increase in live weight and the quantity of the meat, and its employment as additional food is therefore recommended.

The average composition of the gorse as fed was as follows: water, 55·95; nitrogen, 0·84; ether extract, 1·17; soluble carbohydrates, digestible fibre, &c., 19·77; woody fibre, 15·04, and ash, 2·79 (including sand, 1·15 per cent.).

N. H. J. M.

Maintenance Ration of Cattle. By HENRY PRENTISS ARMSBY (*Bul. Pennsylvania State Coll. Agr. Exper. Stat.*, No. 42, pp. 188).—The experiments were made during the years 1892—1893 to 1896—1897. As regards the results relating to digestibility, it is thought that the variations observed are chiefly due to variations in the rate of excretion of the fæces.

The results of twelve experiments indicate that the maintenance food per 500 kilograms of live weight represents 12,771 Cal. at 51° F. The average of nine experiments by Kühn and Kellner computed to

the same weight 12,952 Cal. at 61° F. As a general result, the maintenance of a steer (500 kilos.), receiving mainly or exclusively coarse food, may be placed at 13,000 Cal. of available energy at a temperature of 50—60° F. after deducting energy lost by the formation of methane.

As regards the minimum of proteids, about 300 grams per day per 500 kilos. of live weight is required when the nutritive ratio is 1:11; any material diminution will result in a loss of live weight. When, however, the nutritive ratio is much wider, the amount of proteids may be reduced, at any rate for a time, without any material loss of nitrogen in the body.

N. H. J. M.

Hemp Cake. By ALFRED LEMCKE (*Landw. Versuchs-Stat.*, 1901, 55, 161—182. Compare Abstr., 1894, ii, 113, 155, 291, and 469).—In hot countries, hemp is not grown for the fibre, which is too coarse, or for the seed oil, but on account of a narcotic, resinous secretion, and a constituent which is extracted by boiling.

The average composition of hemp cake (from 661 analyses) was found to be as follows:

Water.	Proteid.	Fat.	N-free extract and crude fibre.	Ash.
10·81	30·76	10·17	40·59	7·67

The amounts of proteid varied from 26·85 to 33·85; the fat from 7·85 to 19·35; the ash was generally normal, but in isolated cases the percentage was as high as 10 or even 14·60. The amount of water varied from 8·30 to 22·28 per cent.

Intentional adulteration of hemp cake seldom occurs, and an abnormal composition is generally the result of imperfect methods of manufacture. Hemp cake is a good substitute for oats for horses, when the amount does not exceed 1 or 1·5 kilogram per day; larger amounts cause thirst and restlessness. Good results were obtained with cows, which received 500 grams of the cake mixed with roots and bran; large quantities cause indigestion and injure the quality of the milk. For fattening, as much as 2·5 kilograms may be given, together with sunflower or cotton cake and crushed barley.

The mean acidity of the cake was found to be 1·08 per cent. (maximum 6·07 and minimum 0·37 per cent.).

The various fungi found in hemp cake are referred to, and also the results of observations showing the number of bacteria, which is very high, per gram.

N. H. J. M.

Nitrogenous Compounds in Molasses. By C. BEGER (*Chem. Zeit.*, 1901, 25, 8—10).—Molasses contain 1·47 per cent. of nitrogen; of this nitrogen, some 5·3—12·2 per cent. is present as proteid nitrogen, 29·3 per cent. in the form of organic bases such as betaine, and 48·3 per cent. as amino-compounds such as glutamine.

Molasses is not a suitable food material for dogs, as when fed on it they lose some 12 grams in weight per day, indicating that the nitrogen compounds present cannot replace proteids.

J. J. S.

Soil Samples From German East Africa. By ALBERT STUTZER (*Bied. Centr.*, 1901, 30, 1—3; see this vol., ii, 283).

Agricultural Value of Madagascar Soils. By ACHILLE MÜNTZ and E. ROUSSEAU (*Compt. rend.*, 1901, 132, 451—456).—The littoral zone of the island is satisfactory as regards fertility. The red soils of the central portions are very poor, especially in potassium and calcium, and are not suitable either for crops or for forests; there are, however, richer soils at the bottom of the valleys. On the whole, the country is not well provided with the materials necessary for the growth of crops, and would not support a very dense population. There are several difficulties in the way of the importation and distribution of manures, but it is thought that much may be effected by irrigation. N. H. J. M.

Elimination of Methane from the Atmosphere. By V. URBAIN (*Compt. rend.*, 1901, 132, 334—336).—Atmospheric methane is constantly produced by the fermentation of cellulose, &c. [Hoppe-Seyler, *Abstr.*, 1886, 577, 932]. The results of analyses made in 1884, by Müntz and Aubin (*Abstr.*, 1885, 118), and in 1900 by Gautier, compared with Boussingault's results, show, however, no increase in the amount of methane. Volta supposed that the methane was burnt under the influence of lightning, whilst Davy, who showed that combustion cannot take place when the gas is diluted with 17 volumes of air, attributed its destruction to the action of ozone.

Experiments made by the author showed that, under the most favourable conditions, methane is only partially oxidised by ozone.

The results of vegetation experiments, extending over several months, in which enclosed plants were supplied from time to time with fresh amounts of methane, showed that considerable amounts of the gas were absorbed. The conclusion is drawn that the accumulation of methane in the air is prevented by its absorption by plants.

N. H. J. M.

Hydrolysis and Decomposition of Fats and Fatty Acids in the Soil. By MAX RUBNER (*Arch. Hygiene*, 1900, 38, 67—92).—Fats suffer little or no decomposition in sterile soil; they are, however, hydrolysed through the agency of bacteria even in dry soil. This decomposition of fats in the soil is much increased in the presence of calcium carbonate, which by interaction with the acids produced by the hydrolysis of the fats forms soaps; these with free fatty acids constitute the "wax" resulting from the decomposition of fats in the soil.

R. H. P.

Calcium Compounds in Soils. Estimation of Assimilable Calcium. By D. MEYER (*Chem. Centr.*, 1901, i, 267—269; from *Landw. Jahrb.*, 29, 913—1000).—Kellner's method for determining the lime requirement of soils is modified as follows. The soil which has passed through a 2 mm. sieve (25 grams) is digested for 3 hours at 100° with 10 per cent. ammonium chloride solution (100 c.c.), diluted to 250 c.c., and filtered through a hardened filter paper (Schleicher and Schüll, No. 602). A tenth of the whole, diluted to 80—90 c.c., is slightly acidified with acetic or citric acid, boiled, and treated with ammonium oxalate in the usual manner. The total calcium should be determined in peat and calcareous soils.

The solubility of calcium in dilute hydrochloric acid varies considerably in different kinds of soils. In heavy soils, most of the

calcium is in the finest portions, whilst in light soils the coarser constituents often contain a good deal. The solubility of the magnesium generally resembles that of the calcium and the amounts of magnesium, phosphoric acid, and sulphuric acid vary, like that of calcium, in the particles of different sizes. In light soils, most of the calcium is in the form of readily decomposable silicates.

When the effect produced by pure calcium carbonate on the growth of plants = 100, that of dolomite and basalt = 99—100; basic slag, scolecite, anorthite, diabase, and nephelite = 80—90; apophyllite = 70—80; phosphorite = 60—70; calcium diphosphate and apatite = 50—60; fluor spar = 40—50; and monocalcium phosphate = 30—40. Calcium and magnesium carbonates together gave the best results, and magnesium sulphate had no favourable effect. Basic slag, among phosphates, gave the best results, then apatite and phosphorite, and lastly di- and mono-calcium phosphates. In using superphosphate, it is of importance to have a sufficient amount of lime to combine with the excess of acid. Basic slag was the only phosphate favourable to leguminous plants; zeolites were, however, especially favourable. Gypsum was injurious in pot experiments.

As a rule, the amount of calcium taken up was about proportional to the growth, but the calcium of silicates was utilised more sparingly than that of carbonates; the relations of the amounts taken up were as follows: calcium carbonate, 100; apophyllite, 69; scolecite, 51·7; and anorthite, 46·7.

The application of magnesium in conjunction with calcium carbonate lowers the percentage of calcium but considerably raises that of magnesium. No relation between the amount of calcium in the soil and the amount taken up by the plant can be shown by determining the carbon dioxide. Abundance of carbon dioxide generally indicates plenty of available calcium, but a low percentage of carbon dioxide is no certain indication of a deficiency.

The results of experiments with rye showed that application of lime had no appreciable effect on the amount of calcium in the grain, and only increased the percentage in the straw when there was no increase in the crop under the influence of lime.

Soil containing 0·25 per cent. of lime, according to the method described above, may be considered normal; but there should not be less than 0·2 per cent. It is quite immaterial whether the soil is light or heavy.

N. H. J. M.

Absorption of Monocalcium Phosphate by Arable Soil and Humus. By J. DUMONT (*Compt. rend.*, 1901, 132, 435—437).—In humous soils, the fixation is not due exclusively to retrogradation, and the amount absorbed depends on the extent of the relation of humus to calcium carbonate, and not on the amount of carbonate.

Abundance of humus distinctly reduces retrogradation.

N. H. J. M.

Influence of Manure and the amount of Water in the Soil on the Growth and Composition of Barley. By CONRAD VON SEELHORST and N. GEORGS (*Chem. Centr.*, 1901, i, 533; from *J. Landw.*, 48, 325—347).—To produce good barley, especially for brewing, nitrogenous manure must be applied in moderation, particularly when the

soil is dry. In moist soils, there is less danger of nitrogenous manure producing highly nitrogenous barley. N. H. J. M.

Effect of different forms of Phosphoric Acid. By FRANZ W. DAFERT and OTTO REITMAIR (*Chem. Centr.*, 1901, i, 231—232; from *Zeit. landw. Versuchs.-Wes. Oesterr.*, 1900, 3, 589—611).—From the results of numerous field experiments, in which attention was given chiefly to the yield of grain, whilst less importance was attached to the amount of phosphoric acid taken up and to the production of straw, the following conclusions are drawn.

Basic slag with high citrate solubility is not better than slag of low citrate solubility; the manure is to be valued according to the total phosphoric acid it contains.

Degelatinised bone meal gave good results with summer cereals, indicating that field experiments alone furnish trustworthy results as to the value of manure, since, according to the results of pot experiments, bone meal is of less value.

Algerian phosphate proved to be equal to basic slag as a manure for summer cereals. Further experiments should be made with crude phosphates on ordinary arable land.

The effect of superphosphate, calculated from the increased yield of grain, was, compared with that of basic slag, as 100 : 70 for oats, and about the same for barley.

The value of the phosphates, as indicated by the above experiments, is not immediately available for agricultural practice; the experiments must be continued for several years. N. H. J. M.

Manurial Effect of Degelatinised Bone Meal. By FRANZ W. DAFERT (*Chem. Centr.*, 1901, i, 533; from *Zeit. landw. Versuchs.-Wes. Oesterr.*, 1901, 4, 96—98).—In reference to the results obtained by Kellner and Böttcher (following abstract), indicating a relation between the effect of bone meal and the amount of calcium in the soil, attention is called to the experiment of the author and Reitmair (preceding abstract). Soils containing much calcium gave, with one exception, greatly increased yields under the influence of bone meal. Unfavourable results are therefore to be attributed to other causes, as yet unexplained. N. H. J. M.

Manurial Action of Bone Phosphoric Acid. By OSCAR KELLNER and O. BÖTTCHER (*Bied. Centr.*, 1901, 30, 7—12; from *Deut. landw. Presse*, 1900, 27, 665).—Experiments are described in which oats were grown in pots containing 6 kilograms of soil (*a*) without phosphatic manure, (*b*) with superphosphate (0.25 gram P_2O_5 , soluble in water), (*c*) with basic slag (0.25 gram P_2O_5 , citrate soluble), and (*d*, 1—10) with bone meal (containing $P_2O_5 = 0.4$ gram). Similar pots received the same manures in double quantity, and there were, in each case, two sets, one with, and the other without, calcium carbonate.

Addition of lime caused in every case a reduction in the yield, but the reduction was essentially less where superphosphate and basic slag were employed than with bone meal. In comparing the amounts of increase due to phosphoric acid applied, it is, however, seen that the

addition of lime is not unfavourable when used in conjunction with basic slag and superphosphate.

In the case of the smaller application of bone meal, addition of calcium carbonate reduced the yield on the average by 67 per cent.

On the majority of soils, the autumn application of bone meal will have a very considerable effect; but the manure should not be applied to calcareous, or to freshly limed, soils. N. H. J. M.

Phosphorite and Green Manure. By A. N. ENGELHARDT (*Chem. Centr.*, 1901, i, 232; from *Zeit. landw. Versuchs-Wes. Oesterr.*, 1900, 3, 631—648).—Field experiments with phosphorite were made from 1886 to 1889. The soil contained very little phosphoric acid in the form of non-assimilable organic compounds. Phosphorite meal gave excellent results with cereals, especially rye, due to the non-crystalline calcium phosphate. The manure is suitable for all soils poor in available phosphates which contain sufficient nitrogen, potash, and lime, but not for soils which give good results without stable manure. When phosphorite ceases to be effective, green manuring should be tried; other minerals, especially marl, might be of use.

N. H. J. M.

Lysimeter Experiments in 1899. By JOSEPH HANAMANN (*Chem. Centr.*, 1901, i, 270; from *Zeit. landw. Versuchs-Wes. Oesterr.*, 1901, 4, 34—39. Compare Abstr., 1899, ii, 515).—Notwithstanding the heavy rainfall during the vegetative period, the drainage was more dilute than previously; the soil having become more consolidated, the dissolved matters were more thoroughly taken up by the roots. Fallow soil lost the most, including nitrogen, then the soil bearing young red-clover plants; the rape and bean soils lost still less, and the soils with summer cereals, which require the most nitrogen, least of all.

Calcium is the most subject to loss; potassium and sodium are lost in about equal amounts. There were considerable losses of chlorine and sulphuric acid, greatest in fallow, and least in bean and clover soils. Traces of phosphoric acid were detected in the drainage from fallow soil, but it could scarcely be detected in the other drainage waters. N. H. J. M.

Analytical Chemistry.

Titration of the Alkalinity of Solutions containing Hypochlorites, Chlorates and Chromates. By HERMANN VON HUBER (*Zeit. Elektrochem.*, 1901, 7, 396—398).—The chromate is first precipitated as the barium salt, and, if present in large quantities, filtered off. The hypochlorous acid and hypochlorites are then destroyed by the addition of a neutral solution of sodium sulphite or sodium thiosulphate, and the alkali titrated, using methyl-orange as indicator.

T. E.

Decomposition of Chlorides by Ignition with Organic Matter. By HERBERT E. DAVIES (*J. Soc. Chem. Ind.*, 1901, 20, 98—100).—The author has found that when chlorides are ignited with organic matter, there is a serious loss of chlorine, particularly in the earlier stages of the combustion. As may be expected, the loss is very great in the case of calcium and magnesium chlorides, but with barium chloride and even sodium chloride there is also a serious loss, not from volatilisation of the compound, but of its chlorine. The loss seems greatest when the amount of chlorides is small, and decreases when the chlorides increase in amount.

The loss may be altogether prevented by adding, before ignition, a solution of sodium carbonate equivalent to 5 per cent. by weight of the organic matter. L. DE K.

Estimation of Sulphides, Hydrosulphides, Polysulphides, and Thiosulphates existing together in Solutions and particularly in Sulphuretted Mineral Waters. By ARMAND GAUTIER (*Compt. rend.*, 1901, 132, 518—523).—The whole of the sulphur existing in solution as free hydrogen sulphide, or one-half of this element contained in a soluble hydrosulphide, is expelled on distilling the liquid under reduced pressure, and may be precipitated as silver sulphide by passing the evolved gas into a half-saturated warm solution of silver sulphate. The soluble monosulphides are not affected by this treatment, and the sulphur in these compounds may be subsequently estimated by distilling the solution in a current of carbon dioxide under reduced pressure. Polysulphides also are decomposed by carbon dioxide, giving off an amount of hydrogen sulphide corresponding with 1 atom of sulphur to each mol. of the compound, whilst the excess of sulphur is precipitated in the free state. When these substances are present, the distillation must be carried out in a vacuum, and at temperatures below 30°, otherwise the precipitated sulphur would react with the alkali carbonate in the following manner, $4S + K_2CO_3 = K_2S_2O_3 + 2H_2S + CO_2$, and moreover the polysulphides themselves are decomposed by hot water in accordance with the equation $K_2S_5 + 3H_2O = K_2S_2O_3 + 3H_2S$.

The sulphur derived from the polysulphide is precipitated by adding zinc acetate and heating the solution to boiling; the precipitate is then oxidised by fuming nitric acid, and the sulphur estimated as barium sulphate.

The thiosulphates in the final filtrate are estimated iodometrically in the ordinary way. G. T. M.

Toxicological Detection of Nitric Acid. By GUSTAVE FLEURY (*Ann. Chim. anal. appl.*, 1901, 6, 12—13).—The finely minced organs, such as the liver, are extracted with thrice their weight of very strong alcohol, and after a few hours the liquid is filtered and the filtrate at once mixed with an excess of calcium hydroxide and left for 12 hours to decompose any ethers. The filtrate is evaporated to dryness, the residue purified by redissolving in alcohol and the residue obtained from this is dissolved in water, when the nitric acid may be detected or estimated according to the usual methods.

A liver which had been moistened with a few grams of nitric acid

and left for three days was found to contain but one-fifth of the original quantity of nitric acid, the remainder having been converted most likely into xanthoprotein.

L. DE K.

Du Pont's Nitrometer. By GEORG LUNGE (*J. Soc. Chem. Ind.* 1901, 20, 100—101).—A reply to Pitman (this vol., ii, 192). It is stated that "Du Pont's five part nitrometer" is to all intents and purposes identical with the author's gasvolumeter (*Abstr.*, 1890, ii, 660).

L. DE K.

The Citric Acid Solubility of the Phosphoric Acid contained in Bone Meal. By THEODOR METHNER (*Zeit. angew. Chem.*, 1901, 134).—The citric acid solubility of the phosphoric acid contained in bone meal free from gelatin is equal to that contained in basic slag. In testing, it must be remembered that bone meal contains about twice the amount of phosphoric acid of the basic slag and consequently only 2.5 grams of the sample should be rotated for half an hour with 500 c.c. of a 2 per cent. solution of citric acid

L. DE K.

Estimation of Phosphoric Acid in Manures, Soils, and Ashes, by the Direct Weighing of the Phosphomolybdate. By NORBERT VON LORENZ (*Landw. Versuchs.-Stat.*, 1901, 55, 183—220).—The extracts are prepared as follows: (1) Phosphoric acid soluble in water: superphosphates (20) and double superphosphates (10 grams) per litre. (2) Citrate soluble phosphoric acid: Basic slag is extracted with ammonium citrate according to Wagner's method, and superphosphate by Petermann's method. (3) Phosphoric acid soluble in citric acid: Wagner's method with 2 per cent. acid. (4) Total phosphoric acid: Superphosphate and basic slag (5 grams) is treated with strong sulphuric acid (35 c.c.) or nitric acid (100 c.c.) and diluted to 500 c.c. All other phosphates containing more than 10 per cent. of phosphoric acid are extracted as just described. In the case of horn meal and manures containing less than 10 per cent. of phosphoric acid, the substance (10 grams) is treated with 50 c.c. of sulphuric or 100 c.c. of nitric acid, and diluted to 500 c.c. Soils (25 grams) are treated in the usual manner with not more than 200 c.c. of nitric acid; water (about 200 c.c.) is added, and, when cold, 10 c.c. of strong sulphuric acid. The whole is diluted to 500 c.c.

The following amounts of the different extracts are employed: (1) 10 c.c., (2) 15 and 10 c.c., (3) 15 c.c.; (4) superphosphates and basic slag, 15 c.c.; bone meal, &c., 20 c.c.; horn meal, &c., 15 c.c., and soils, 50 c.c.

The following solutions are prepared: (1) Pure dry ammonium molybdate (300 grams) is dissolved in a litre flask which, when cold, is filled to the mark; the solution is poured in a thin stream into a solution of 100 grams of pure dry ammonium sulphate in 1000 c.c. of nitric acid of sp. gr. 1.36 at 15°. The solution is left for 48 hours, filtered and kept in the dark. (2) A mixture of sulphuric acid of sp. gr. 1.84, 30 c.c., and nitric acid of sp. gr. 1.20 at 15°, 1 litre. (3) Ammonium nitrate (2 per cent.). Also nitric acid of sp. gr. 1.20 at 15°; alcohol (90—95

per cent.), free from dissolved matter and not alkaline ; and ether free from alcohol and sufficiently dry.

Estimation of Phosphoric Acid in the Extracts.—Extracts prepared with sulphuric acid (15—20 c.c.) are made up to 50 c.c. with nitric acid of sp. gr. 1.20 ; all other extracts (except soil extracts, of which 50 c.c. are employed) are made up to 50 c.c. with the mixture of nitric and sulphuric acids. The solution is then heated until the first bubbles are formed, and 50 c.c. of the sulphate-molybdate solution added. After about 5 minutes, the mixture is well stirred, left for 2—18 hours, or, when less than 3 mg. of phosphoric oxide is present, for 12—18 hours, and filtered through a platinum Gooch crucible (with a filter paper just covering the holes) under as much pressure as possible. After washing four times with ammonium nitrate solution, three times with alcohol, and three times with ether, the crucible is kept in a desiccator (without drying materials) under diminished pressure (100—200 mm.) for 30 minutes and weighed. The precipitate contains 3.295 per cent. of phosphoric oxide.

An apparatus is described in which several determinations can be carried on at the same time.

It is important for the ammonium molybdate to be as pure as possible. The amounts of extracts used for the separate determinations are such that they will never contain more than 50 mg. of phosphoric oxide ; larger amounts would render the drying with ether more difficult. The filter papers are rendered air dry by first heating at about 125° and then keeping them spread out for 24 hours. The ether-dried precipitate must be weighed as soon as it is taken out of the desiccator.

The method has the advantage over the direct citrate-precipitation method that the results are not affected by keeping citrate and citric acid extracts, containing silica, for several days. A further advantage is that the platinum crucibles are not injured in the process.

The results of determinations of phosphoric acid in solutions to which different compounds were added showed that no effect was produced by the various substances which may occur in manures and soils.

N. H. J. M.

Detection of Arsenic in the presence of Sulphites, &c. By JAMES F. SMITH (*Chem. News*, 1901, 83, 2—3).—Arsenic may be detected in the presence of compounds giving off hydrogen sulphide in the usual way in a Marsh apparatus, inasmuch as when the hydrogen sulphide and arsenide are heated together they react, hydrogen is set free and arsenic sulphide and sulphur are deposited in the tube or on the porcelain surface. The sulphur may be removed by carbon disulphide and the arsenious sulphide dissolved in ammonia, precipitated with hydrochloric acid, and tested. The original solution should be added 1 or 2 c.c. at a time to the acid and zinc, and an inch of the delivery tube in the centre should be kept red hot to avoid loss. Fifteen parts of arsenic per 1,000,000 have been detected in 5 c.c. of beer in presence of sodium hydrogen sulphite, and without previous treatment, by this means. This reaction also applies to antimony.

D. A. L.

Arsenic in Beer. By EDWARD W. T. JONES (*Chem. News*, 1901, 83, 25—26).—Two hundred and fifty c.c. of beer are evaporated to about 100 c.c., 25 c.c. of pure, strong hydrochloric acid are added, a piece of copper gauze 1 inch by $\frac{1}{4}$ inch is immersed, and the boiling continued; if the gauze is stained it is examined for arsenic in the usual way. For quantitative purposes, rolls of gauze 1 inch by $3\frac{1}{2}$ inches are used, and as one becomes blackened it is replaced by a bright one. The arsenic is removed by digesting the rolls of gauze in 5 c.c. of *N* sodium hydroxide to which 3 or 4 drops of 10 vol. hydrogen peroxide are added; the solution is tested, filtered, treated with 7 c.c. of *N* sulphuric acid, and saturated with sulphur dioxide which is then expelled by boiling. The warm solution is added to 50 c.c. of hydrogen sulphide solution and the gas passed for a time, the arsenious sulphide is washed, dissolved in hot dilute ammonia, filtered, evaporated to dryness, cooled, treated with three drops of water, just acidified with dilute hydrochloric acid, again dried, 3 c.c. of hydrogen sulphide solution added, again dried, rinsed successively with water, carbon disulphide, alcohol and water, again dried, cooled, and weighed; it is then treated with hot ammonia, any residue being weighed and deducted. D. A. L.

Arsenic in Beer. By JOHN RYDER and ALFRED GREENWOOD (*Chem. News*, 1901, 83, 61).—Two litres of beer are concentrated to 1 litre, and boiled with 3 or 4 grams of copper foil, and 166 c.c. of hydrochloric acid of sp. gr. 1.16; after an hour the beer is poured on to fresh copper for any further deposit. The coated copper is washed, dissolved in nitric acid, the excess of acid driven off, and the arsenic determined by the method recommended by Blair for the estimation of small quantities of the element in iron and steel. D. A. L.

Volumetric Estimation of Boric Acid. By H. LÜHRIG (*Chem. Centr.*, 1901, i, 538; from *Pharm. Central. Halle*, 1901, 42, 50—56).—The author confirms the opinion of Beythien and Hempel (*Abstr.*, 1900, ii, 313), and of Fischer (*ibid.*, 367), as to the accuracy of Jörgensen's process for the estimation of boric acid in foods (*Abstr.*, 1897, ii, 283). When testing meat, it is recommended to moisten the sample with strong aqueous sodium hydroxide, and to evaporate to dryness with addition of a little sodium carbonate with constant stirring; the dry mass is then burnt to ash. Gladding's process (*Abstr.*, 1898, ii, 483) offers no advantages over Jörgensen's method, being more complicated and less rapid. L. DE K.

Detection of Carbon Monoxide in the Air. By NATHAN ZUNTZ and S. KOSTIN (*Chem. Centr.*, 1901, i, 476; from *Arch. Anat. Phys.* (His-Engelmann), *Physiol. Abt.*, 1900, *Suppl.*, 315—316).—A few litres of the air to be tested are collected in a glass bottle containing iron gauze moistened with ammoniacal water; after half an hour, the oxygen will be removed. If the residual gas is now passed through a solution of blood (1 : 100—200) carbon monoxide may be detected, even if the air only contained 1/40,000 part of that gas. L. DE K.

Detection of Minute Quantities of Carbon Monoxide in Blood and Air. By S. KOSTIN (*Pflüger's Archiv*, 1901, 83, 572—608).—A method of gas analysis is described with diagrams, by which minute amounts of carbon monoxide can be detected. Kunkel's tannin test is found to be the most delicate. Other methods, including Haldane's, are adversely criticised. Minute quantities of the gas are not absorbed by the blood if oxygen is present also. Cooling of blood to 0° increases its power of absorbing carbon monoxide. The method of detecting carbon monoxide in air is described in the preceding abstract.

W. D. H.

Estimation of Zinc. By W. HERZ (*Zeit. anorg. Chem.*, 1901, 26, 90—93).—See this vol., ii, 240.

Separation of Zinc from Nickel and Cobalt. By FREDERICK P. TREADWELL and G. H. KRAMERS (*Zeit. anorg. Chem.*, 1901, 26, 104—107).—The authors have examined Zimmermann's method (*Abstr.*, 1880, 188; 1881, 122), which consists in precipitating the zinc with hydrogen sulphide in the presence of ammonium thiocyanate. They find that accurate results are also obtained by precipitation in the presence of ammonium or potassium sulphate or chloride.

E. C. R.

Analysis of Samarskite. By ARTHUR GARFIELD LEVY (*Analyst*, 1901, 26, 64—67).—One gram of the finely powdered mineral is fused with 6 grams of potassium hydrogen sulphate in a platinum crucible until quite decomposed. When cold, the mass is treated with warm water until completely disintegrated, and the well-washed residue is strongly ignited and weighed as crude oxides of silicon, niobium, and tantalum.

The filtrate is mixed with some hydrochloric acid and then precipitated in a closed flask with an excess of ammonia; the filtrate, which generally retains some of the uranium and alumina, is boiled to recover it, and the filtrate from this examined, as usual, for calcium and magnesium.

The two ammonia precipitates are dissolved in hydrochloric acid, and the alumina is separated by means of sodium hydroxide; the rare earths are then thrown down as oxalates, and converted into oxides by ignition, and in the filtrate the iron and uranium are separated by means of ammonium sulphide and carbonate, the uranium being finally weighed as U_3O_8 , and also as UO_2 by way of control. An aliquot part of the crude oxides of silicon, niobium and tantalum, is again fused with potassium hydrogen sulphate; the resulting filtrate is treated as described above, and the residue freed from silica by treatment with hydrofluoric and sulphuric acids; the ignited oxides are dissolved in hydrofluoric acid, and the solution poured into a solution of potassium hydrogen fluoride, when a crystalline precipitate is formed which dissolves on heating (Marignac has stated that the oxides are insoluble in hydrofluoric acid, but the author finds them to be readily soluble in the warm acid). The solution is now evaporated to dryness on the water-bath; the residue is taken up with a little hot water, and allowed to crystallise. The crystals which contain potassium tantalifluoride, and the liquid which contains the nioboxyfluoride, K_2NbOF_5 , are both evaporated with sulphuric acid, and the oxides of tantalum and niobium

so obtained are weighed. As neither oxide is quite pure, it must be freed from niobium or tantalum respectively by a second treatment with hydrofluoric acid.

Silica is estimated in another portion of the crude oxides, or in the ignited mineral itself, by the loss caused on evaporation with hydrofluoric and sulphuric acids. The separation of the rare earths into ceria and yttria groups is effected approximately as follows. The ignited oxalates are dissolved in hydrochloric acid with the aid of a little potassium iodide; a small residue may be left undissolved, and should be weighed and identified if possible. The solution is evaporated to dryness, the residue treated with a little water, and then with a saturated solution of potassium sulphate; after 2 days, the crystalline precipitate is washed with a solution of potassium sulphate, and the filtrate mixed, first with hydrochloric acid and then with ammonia in excess. The precipitate containing the oxides of the yttria group is washed, and then purified by dissolving it in hydrochloric acid and reprecipitating with ammonia, and finally ignited and weighed.

The precipitate containing the double potassium sulphates of the cerium group is dissolved in hydrochloric acid, and the oxides are then precipitated by ammonia, washed, ignited, and weighed.

The following result was obtained by the author in the analysis of a sample of samarskite: silica, 2·86; niobic oxide, 31·52; tantallic oxide, 16·63; ferric oxide, 10·68; aluminium oxide, 3·07; uranium trioxide, 12·13; calcium oxide, 3·34; magnesium oxide, 0·10; "cerium" oxides (free from true cerium oxide), 1·65; "yttrium" oxides, 14·32; "insoluble" oxides, 0·79; loss on ignition, 2·48. Total, 99·57 per cent.

L. DE K.

[Analysis of] Soils. By J. HAZARD (*Chem. Centr.*, 1901, i, 228—231; from *Landw. Jahrb.*, 29, 805—911).—The following method of soil-sampling is recommended. A hole 50 cm. wide and 35 cm. deep is made, the soil well mixed, and two samples (2·5 and 10 kilos.) weighed out. The smaller sample is kept, the larger sample being employed on the spot for determining stones (more than 10 mm.). The air dry sample is sifted through 10 and 3·5 mm. sieves. A portion (25—30 grams) is boiled for half an hour with fairly strong aqueous potash to remove the organic matter. Concretions of iron ore must be looked for in the residues on the sieves down to 0·15 mm.

The method employed for estimating kaolin depends on the fact that kaolin is not acted on by boiling hydrochloric acid, whilst it is decomposed by sulphuric acid. It is shown that soil treated with strong hydrochloric acid can only contain quartz, acid felspar, augite, and kaolin; the kaolin is conveniently extracted with sulphuric acid. The relation of alumina to ferric oxide or to lime will show the amount of augite if there is any present, and this is deducted from the total aluminium. Fineness of the sample is essential.

For ordinary agricultural purposes, the tenacity due to kaolin is determined by preparing four balls (30 grams each) which are then air-dried. One of the balls is placed with two marbles of equal size so as to form a triangle; the three are covered with a board and weights applied until the clay ball breaks. The other clay balls are

similarly treated and the mean of the four results adopted. The method gives very satisfactory results. N. H. J. M.

Chemical Investigation of Soil Samples from German East Africa. By ALBERT STUTZER (*Bied. Centr.*, 1901, 30, 1—3; from *Mitt. Landw. Inst. K. Univ. Breslau*, 1900; *Hefst.* 3, 29. Compare Wohltmann, *Abstr.*, 1897, ii, 463, and 1898, ii, 251).—The following modifications have been made in the methods previously described. For the estimation of potassium, calcium, iron, aluminium, and phosphoric acid, 200 c.c. of the acid extract are evaporated down instead of 500 c.c. The addition of sodium chloride is omitted in determining potassium; an amount of extract corresponding with 60 grams of soil is used.

In determining calcium in presence of much iron and aluminium, 50 c.c. of the liquid are neutralised with ammonia and strongly acidified with oxalic acid at the ordinary temperature; the precipitate is washed with 2 per cent. oxalic acid. Iron and aluminium are estimated by precipitating with ammonia, dissolving in hydrochloric acid, and again precipitating with ammonia; the washed precipitate is ignited and weighed, and the amount of phosphoric acid deducted. Nitrogen is determined in 100 c.c. of the cold hydrochloric acid extract. The results of analyses of 25 samples are given.

N. H. J. M.

Estimation of Clay in Soil. By AIMÉ PAGNOUL (*Ann. Agron.*, 1901, 27, 94—96).—An amount of soil containing 5 grams of dry matter is washed three times with, altogether, 100 c.c. of dilute ammonia (1 c.c. of ammonia in 100 c.c. of water); the soil is rubbed with the finger against the sides of the dish and the whole allowed to settle for 10—15 seconds before the liquid is poured off. The soil is then boiled with the same solution for 2—3 minutes. When cold, more ammonia (1 c.c.) is added, and the liquid and soil transferred to a cylinder of 100 c.c. capacity (22 cm. from the bottom to the 100 c.c. mark) provided with a tap at the 20 c.c. mark. Distilled water is now added to make up to 100 c.c., after which the cylinder is violently shaken and allowed to rest for 5 minutes. The upper 80 c.c. are drawn off, treated with about 20 drops of acetic acid, and filtered. The precipitate is washed with water until free from lime, dried, and ignited. The weight of the residue multiplied by $100/80 \times 20$ gives the percentage of clay in the dry soil. A small amount of fine sand will be included, but the results are considered to be approximately correct. As a rule, the results vary from 10 to 20 per cent.; the highest amount of clay found was 57 per cent.

The filtrate from the clay precipitate may be utilised for determining the chalk present in an impalpable state. N. H. J. M.

Estimation of Manganese in Ferro-Chromium Alloys. By J. T. (*Chem. News*, 1901, 83, 25).—One gram of the alloy is fused with a large excess of sodium peroxide, then treated with water, and the precipitate boiled repeatedly with water containing a small quantity of ammonium carbonate; it is then dissolved in nitric acid of sp. gr. 1.20 diluted with equal volume of water, and in presence of a large

quantity of solution of ferrous sulphate, the solution is oxidised with sodium bismuthate, and the filtered permanganate titrated with hydrogen peroxide as directed by Reddrop and Ramage (*Trans.*, 1895, **67**, 268).
D. A. L.

Estimation of Ferrous Oxide in Silicates: Influence of Pyrites. By LUCIEN L. DE KONINCK (*Zeit. anorg. Chem.*, 1901, **26**, 123—124. Compare Hillebrand and Stokes, *Abstr.*, 1900, **ii**, 763).—A question of priority.
E. C. R.

Vogel's Method for the Detection of Cobalt. By FREDERICK P. TREADWELL [and E. VOGT] (*Zeit. anorg. Chem.*, 1901, **26**, 108—110).—To test a nickel salt for cobalt, a solution of the salt is treated with a concentrated solution of ammonium thiocyanate and the mixture shaken with a few c.c. of amyl alcohol. In the presence of 0.02 mg. of cobalt, the amyl alcohol assumes a blue colour; if iron is present, the red colour of the ferric thiocyanate must be destroyed by shaking with sodium hydroxide.

The blue coloration is due to the salt $(\text{NH}_4)_2\text{Co}(\text{SCN})_4$, which crystallises from amyl alcohol in beautiful, blue needles. The potassium salt, $\text{K}_2\text{Co}(\text{SCN})_4$, is obtained in a similar manner (Rosenheim and Cohn, *Abstr.*, 1900, **i**, 381).
E. C. R.

Reactions of Cobalt and Iron. By HUGO DITZ (*Chem. Zeit.*, 1901, **25**, 109—112).—See this vol., **ii**, 223.

Estimation of Chromium and Iron by Potassium-Iodide-Iodate Mixture. By ALFRED STOCK and CORNELIUS MASSACIU (*Ber.*, 1901, **34**, 467—469).—Chromium and iron may readily be estimated by the method previously described for aluminium (*Abstr.*, 1900, **ii**, 247). It is not necessary to have the iron in the ferric condition before precipitation. In the case of both metals, granular precipitates are obtained which can readily be filtered and washed. A further advantage is that even minute quantities of the metals are precipitated by this reagent, and do not tend to remain in solution as is the case when ammonia is employed.
J. J. S.

[Detection of] Tungsten. By EDOUARD DEFACQZ (*Ann. Chim. Phys.*, 1901, [vii], 238—288).—See this vol., **ii**, 244.

Analysis of Tungsten- and Chrome-steel. Estimation of Tungstic Acid and its Separation from Silicic Acid. By OTTO HERTING (*Zeit. angew. Chem.*, 1901, 165—166).—McKenna's process for the estimation of tungsten and chromium in steels is criticised. The author gives a new process for the estimation of the tungsten. One to three grams of the ferrotungsten are treated with nitro-hydrochloric acid and evaporated twice with nitric acid on the water-bath. The mass is dried at 120°, and then dissolved in dilute nitric acid; the insoluble matter, consisting of tungsten trioxide, silica, and a little ferric oxide, is fused with sodium carbonate and the fused mass treated with water, when a residue of ferric oxide is left, which should be tested for traces of silica. The filtrate is evaporated twice with nitric acid, and the residue treated with dilute nitric acid, which leaves the silica and tungsten trioxide undissolved. These are collected and

weighed, and then fused with five times their weight of potassium hydrogen sulphate; the fused mass is digested with a cold solution of ammonium carbonate which dissolves the tungsten trioxide and leaves the silica undissolved; the latter is weighed and the former obtained by difference. The tungsten may also be estimated volumetrically by suspending a well-washed moist precipitate of silica and tungsten trioxide in hot water and titrating with normal sodium hydroxide, using phenolphthalein as indicator. One c.c. of the solution = 0.092 gram of tungsten.

L. DE K.

Colorimetric Estimation of Titanic Acid. By JAMES BRAKES (*J. Soc. Chem. Ind.*, 1901, 20, 23. Compare Abstr., 1900, ii, 248).—This is a modification of Baskerville's method (Abstr., 1900, ii, 629), differing from it in so far that the residue left from the first filtrate is fused with potassium sodium carbonate and then heated with sulphuric acid. In preparing the standard solution, the chemically pure titanium dioxide is fused with the mixed carbonate instead of potassium hydrogen sulphate, and then heated with strong sulphuric acid. To standardise the solution, 10 c.c. are diluted with 25 c.c. of water and precipitated with ammonia, the precipitate is washed with hot water and ignited; the contents of the crucible are then moistened with a few drops of dilute sulphuric acid (1 : 1) and a few c.c. of hydrofluoric acid, and the whole is evaporated to dryness, ignited, and weighed.

L. DE K.

Brandy Flavouring Essences. By ADOLF BEYTHIEN and PAUL BOHRISH (*Zeit. Nahr. Genussm.*, 1901, 4, 107—110).—A table is given showing the composition of some brandy flavourings. The alcohol was estimated by Hefelmann's process (Abstr., 1897, ii, 605). The residue from the light petroleum was tested for resinous matters, and piperine by Polenske's method. For the estimation of the fusel oil, 20 c.c. of the sample were mixed with 75 c.c. of absolute alcohol and then diluted with water to 100 c.c. Twenty-five c.c. of this mixture were diluted with 200 c.c. of water and 5 c.c. of aqueous potassium hydroxide and submitted to distillation; the distillate was then made up to 200 c.c., and after its sp. gr. had been taken it was tested with the usual precautions in Rose's apparatus. Two of the samples were found to contain piperine and one capsaicin.

L. DE K.

The Furfuraldehyde Reaction in Brandy Testing. By TH. WETZKE (*Zeit. öffentl. Chem.*, 1901, 7, 11—16).—The author has examined a large number of brandies (cognac), pure and adulterated, and has come to the conclusion that the presence of furfuraldehyde gives no guarantee that the samples are really the product of the distillation of pure wines, particularly as furfuraldehyde is often added to spurious articles to deceive the analyst. The complete absence of furfuraldehyde in a sample is also not a safe proof of its adulteration.

L. DE K.

Estimation of Glycerol. By JULIUS LEWKOWITSCH (*Analyst*, 1901, 26, 35—36).—The author has tried the process based on the isolation of the glycerol carbon by means of sulphuric acid, as proposed by Laborde (Abstr., 1899, ii, 816) and approved of by Jean (Abstr.,

1900, ii, 694). A large number of test experiments are given, showing that nothing like even approximate results can be obtained by this process.

L. DE K.

Estimation of Sugar by Fehling's Solution, and Conversion of Cuprous into Cupric Oxide without the use of Asbestos Filters. By PAUL SOLTSIEN (*Chem. Centr.*, 1901, i, 343; from *Pharm. Zeit.*, 1901, 46, 28).—The mixture of Fehling's solution and sugar which has been heated as usual is diluted with about 3 volumes of boiling water. The cuprous oxide can then be collected on an ash-free paper filter. It is washed until the washings cease to redden phenolphthalein, then dried and ignited in a platinum basin. It is then dissolved in the smallest possible quantity of a mixture of sulphuric acid (5 parts) and nitric acid (3 parts), and the solution evaporated and ignited until the weight is constant. Copper sulphide may be converted into cupric oxide in a similar manner.

M. J. S.

Kjeldahl's Method of Sugar Estimation. By RUDOLF Woy (*Chem. Centr.*, 1901, i, 343; from *Zeit. öffentl. Chem.*, 1900, 6, 514).—The author highly commends Kjeldahl's process (*Abstr.*, 1896, ii, 453, 580) as well as the extension of it by Jessen-Hansen (*Abstr.*, 1900, ii, 113), but considers that the absorption of carbon dioxide by the alkali hydroxide is a source of considerable error, and that the working out of complete tables for the employment of sodium carbonate instead of hydroxide, according to Müller's method, would be a great improvement.

M. J. S.

Colour Reactions of Sugars. By CARL NEUBERG (*Zeit. physiol. Chem.*, 1901, 31, 564—573).—The behaviour of a number of synthetic sugars, namely, glycolaldehyde, glyceraldehyde, glycerose, *l*-erythrose, *i*-tetrose, *d*-lyxose, *d*-hydroxygluconic acid, aldehydomucic acid, and formose, towards α -naphthol, resorcinol, phloroglucinol, and orcinol in the presence of hydrochloric acid has been studied.

The α -naphthol test is given by all the sugars. The resorcinol test gives positive results with glycerose, *i*-tetrose, formose, and *d*-hydroxygluconic acid, and hence appears to work with ketoses only. The phloroglucinol test is given by all the sugars with the exception of glycolaldehyde, but the colour varies considerably in intensity. The orcinol test gives no characteristic colour with glycolaldehyde or *i*-tetrose, and appears to be the best test for pentoses.

J. J. S.

Lindet's Process for the Estimation of Dextrose and Dextrin in Commercial Glucose. By JEAN MEUNIER (*Bull. Soc. Chim.*, 1901, [iii], 25, 250—251).—The author criticises Lindet's process (this vol., ii, 134) favourably, but finds that the somewhat tedious estimation of the total carbon by combustion may advantageously be replaced by a determination of the calorific power of the glucose.

N. L.

Volumetric Estimation of Invert Sugar. By F. STOLLE (*Zeit. Ver. deut. Zuckerind.*, 1901, 111—117).—This method consists in precipitating a known volume of Fehling's solution with the invert sugar solution, and afterwards estimating the excess of Fehling's solution by titration with potassium cyanide in ammoniacal solution, the colour

being discharged owing to the formation of colourless potassium cuprous cyanide. To convert the copper of the residual Fehling's solution into ammoniocupric salt, sufficient of a mixture of 100 c.c. of concentrated ammonia solution with 50 grams of ammonium carbonate dissolved to 500 c.c. is added to give the liquid a deep blue colour. The potassium cyanide solution may be standardised by means either of pure copper sulphate or of pure copper dissolved in nitric acid. It is important that the same pipettes should always be employed for mixing the Fehling's solution or else that only accurately graduated pipettes be used. If necessary, the invert sugar solution is decolorised by means of basic lead acetate, the excess of lead being removed in the usual way. The method is carried out as follows. Ten or five grams of the sugar are dissolved in water and made up to 100 c.c., 50 c.c. of the solution being then mixed with 50 c.c. of Fehling's solution and the liquid boiled for exactly two minutes. The flame is removed and 50 c.c. of cold, air-free, distilled water added, after which the solution is transferred to a 250 c.c. flask, made up to volume at the normal temperature, and filtered. To 50 c.c. of the filtrate heated to 80–90° in a porcelain basin, 40 c.c. of the ammoniacal ammonium carbonate solution are added, and the standard potassium cyanide solution, containing conveniently about 25 grams per litre, run in until the solution is completely decolorised. The results obtained by this method agree well with those yielded by the ordinary gravimetric method in which the reduced copper is weighed, 9.5 grams of pure sucrose after inversion yielding 236.53 milligrams of copper by the volumetric method, and 236 by the gravimetric, whilst 20 grams of a raw sugar gave respectively, 53.9 and 54.9 milligrams by the volumetric and gravimetric methods. The new process can, of course, be applied to the estimation of all sugars which reduce Fehling's solution.

T. H. P.

Influence of Temperature on the Specific Rotation of Sucrose. By OTTO SCHÖNROCK (*Zeit. Ver. deut. Zuckerind.*, 1901, 106–111).—The author criticises Wiechmann's paper [*ibid.*, 1900, 902 (technical part)] on this subject.

Calculating from the temperature coefficient of the specific rotation of sucrose, previously found by the author to have the value 0.000217 (Abstr., 1900, i, 378), it is shown that if a normal sucrose solution, containing 26 grams in 100 c.c., be prepared at 20° and be read at t° in a saccharimeter whose quartz wedges are also at t° , then the reading must be increased by 0.065 ($t - 20$) in order to obtain the real hundred point at 20°; this only holds if t does not differ much from 20.

T. H. P.

Molasses and similar Products from Sugar Factories. By KARL ANDRLÍK, K. URBAN, and VL. STANĚK (*Zeit. Zuckerind. Böhm.*, 1901, 25, 247–272).—After giving a historical account of the work previously published on the analysis and composition of molasses, the authors describe the methods employed and the results obtained in the complete analysis of a number of samples of molasses before and after osmosis, osmose waters, and syrups. The paper does not admit of satisfactory abstraction.

T. H. P.

Chocolate-Flour. By ADOLF BEYTHIEN and HANS HEMPEL (*Zeit. Nahr. Genussm.*, 1901, 4, 23—25).—Analyses of six samples of artificially coloured prepared cocoas consisting chiefly of sugar and flour with but 9 to 16 per cent. of chocolate, and sold under fancy names.

The sugar was estimated by Woy's process (*Abstr.*, 1899, ii, 187). The total fatty matter was obtained by extraction, and the quantity of cocoa-fat and wheat flour-fat calculated from its iodine absorption figure, assuming that of pure cocoa-fat to be 34 and that of wheat flour-fat 115.

L. DE K.

Estimation of Pentosans by means of the Hydrochloric Acid Phloroglucinol Method. By E. KRÖBER (*Chem. Centr.*, 1901, i, 477—478; from *J. Landw.*, 1901, 48, 357—384).—This process gives correct results if the proper precautions are taken. The condensation product should be collected in a Gooch crucible and the wash water added in small portions and not until the precipitate looks almost dry; the washing must be continued until every trace of chlorine is removed. The precipitate should be dried for 4 hours at 98·5—100°, and the crucible afterwards cooled in a weighing tube under a desiccator.

L. DE K.

Detection of Oxycellulose. By MAX PHILIP (*Chem. Centr.*, 1901, i, 342; from *Zeit. öffentl. Chem.*, 1900, 6, 524).—Some cotton fabrics, which after bleaching in a bath of chloride of lime had been piled up and exposed to the air for some time, were found to have been partially converted into oxycellulose. When hot calendered, they showed yellowish to brownish stains, which gradually faded to a yellowish tone, and when heated with Fehling's solution cuprous oxide was deposited on the spots which had shown the brown stain. M. J. S.

Detection of Tragacanth and Dextrin in Cocoa and Chocolate and Approximate Estimation of Dextrin by Polarisation. By PAUL WELMANS (*Chem. Centr.*, 1901, i, 65; from *Zeit. öffentl. Chem.*, 1900, 6, 478—483).—Tragacanth is not likely to be used for adulterating cocoa or chocolate on account of its high price, but if its presence is suspected it may be detected by rubbing 5 grams of material, freed from fat, with dilute sulphuric acid, adding 10 drops of solution of iodine and a little glycerol, and examining under the microscope. If tragacanth is present, the field will be covered with a large number of blue tragacanth cells, which, however, closely resemble potato or wheat starch.

Adulteration with gelatin may be suspected when the sample contains an excess of water and more than 30—33 per cent. of proteids calculated on fat free matter. It may be readily detected by Onfroy's picric acid process (*Abstr.*, 1899, ii, 76).

Dextrin may be detected in the aqueous solution left when extracting the fat with ether according to the author's process, by adding 40 c.c. of alcohol to 10 c.c. of the filtrate. Its estimation is based on the fact that, although not precipitated by basic lead acetate, it is completely precipitated by an ammoniacal solution of the salt. By polarising the aqueous solution before and after addition of ammonia, the dextrin may be calculated by means of the expression

$d = (a - b)/2$, in which a represents the apparent total sugar and b the actual sugar present. It is necessary to divide by 2, as dextrin has twice the polarising power of sugar. The results are more accurate than those obtained by the usual gravimetric copper process.

L. DE K.

Use of Millon's Reagent. By OTTO NASSE (*Pflüger's Archiv*, 1901, 83, 361—368. Compare Plugge, *Arch. Pharm.*, 1890, 28, 9; Vaubel, this vol., i, 28).—The reagent is best prepared by mixing mercuric acetate solution with a few drops of a 1 per cent. solution of an alkali nitrite. It may be used either with or without the addition of acetic acid. Nitric acid should not be present. Hydrogen peroxide, alcohol, and large amounts of chlorides interfere with the colorations. Only a small amount of the reagent, and a moderate temperature are advisable.

Ortho-substituted phenols give a brownish-red colour, and the corresponding para-compounds a blue-red or even blue colour. Phenols which have both ortho- and para-substituents, for example, eugenol and vanillin, and even phenols with no para-substituents, such as thymol and xyleneol, also give blue colours. Most specimens of phenol and salicylic acid give blue colours owing to the presence of small amounts of *p*-cresol and *p*-hydroxybenzoic acid.

Denigès' phenolaldehyde reaction (Abstr., 1900, ii, 378) is readily given by tyrosine but not by peptone or by proteids. The reagent may be made by dissolving a little formaldehyde in concentrated sulphuric acid.

J. J. S.

Estimation of Cresol. By FRIEDRICH RUSSIG and GEORG FORTMANN (*Zeit. angew. Chem.*, 1901, 157—160).—Raschig's process for the estimation of *m*-cresol in mixtures (Abstr., 1900, ii, 694) is recommended. The authors also use another method of French origin, which is briefly as follows. Fifty grams of the sample are treated with 125 grams of sulphuric acid of sp. gr. 1.84 contained in an Erlenmeyer flask; after 1 or 2 hours, the mixture is added drop by drop from a dropping funnel to 400 c.c. of nitric acid of sp. gr. 1.4 contained in a large retort and heated on a sand-bath to 60°, the flame being then removed. About 20 minutes after adding the last portions, the contents are poured into a large porcelain dish containing 200 c.c. of water, and the retort is rinsed with another 200 c.c. of water. After remaining overnight, the cake of trinitrocresol is pressed with a spatula, and then collected on a hardened filter, using the suction pump. After removing the adhering nitric acid by washing with 200 c.c. of water, the compound is dried at 95—100° and weighed. Fifty grams of pure *m*-cresol yield in this way 175.6 per cent. of the nitro-compound and 174 per cent. by Raschig's method. Like the latter, the process fails when the sample contains more than 10 per cent. of phenol.

Ditz's and Cedivoda's volumetric bromine process (Abstr., 1900, ii, 54) has been submitted to a thorough investigation and found to be untrustworthy.

L. DE K.

Estimation of Cresol. By HUGO DITZ (*Zeit. angew. Chem.*, 1901, 160—165).—An elaborate reply to Russig and Fortmann (preceding

abstract), who, according to the author, have used too large an excess of bromine in their experiments. Other objections to their work are raised.

L. DE K.

Detection of Succinic Acid. By CARL NEUBERG (*Zeit. physiol. Chem.*, 1901, 31, 574—578).—The substance to be tested is evaporated down to a small volume with excess of ammonia, and then heated with zinc dust; if succinic acid was originally present, pyrrole is produced and may be tested for by the usual pine-wood splinter, moistened with hydrochloric acid. If succinates of heavy metals are present, it is advisable to add ammonium carbonate, or even ammonium phosphate, before the zinc dust. Other substances which are readily convertible into pyrrole must be removed before the test is applied. The more commonly occurring natural products which give the pyrrole test are albumin, hæmin, and indole derivatives, which may be readily removed.

J. J. S.

Estimation of Malic Acid. By ALBERT HILGER (*Zeit. Nahr. Genussm.*, 1901, 4, 49—50. Compare Abstr., 1900, ii, 768).—The following process is recommended for estimating malic acid in wines. One hundred c.c. of the sample are evaporated to one-third, and then rendered faintly alkaline by adding basic lead acetate. The precipitate which contains all the malic acid is collected, washed four or five times with cold water, and then dissolved in a little boiling dilute acetic or nitric acid. This solution is neutralised at the boiling point with excess of sodium carbonate, while a current of carbon dioxide is being transmitted. The filtrate is evaporated to 100 c.c., neutralised with hydrochloric acid, and then boiled for 10 minutes in an Erlenmeyer flask with 10 c.c. of a 5 per cent. solution of palladium chloride. After faintly acidifying with hydrochloric acid, the reduced palladium is collected in an Allihn tube, heated in a current of carbon dioxide, and weighed; 0.294 gram of palladium corresponds with 1 gram of malic acid.

L. DE K.

Estimation of the Nitrogen of Amino-acids in Urine. By MARTIN KRÜGER and JULIUS SCHMIDT (*Zeit. physiol. Chem.*, 1901, 31, 556—563).—The method is very similar to that described by Pfaundler (Abstr., 1900, ii, 674). Care must, however, be taken not to use too large an excess of phosphotungstic acid in precipitating the nitrogen compounds. The total nitrogen in 5 c.c. of the urine is determined by Kjeldahl's method. The total nitrogen in an equivalent quantity of the phosphotungstic acid filtrate is determined by the same method, and also the carbamide nitrogen in the same volume of filtrate is determined by heating with half its volume of concentrated sulphuric acid at 160—180° for 3—4 hours. The difference between the last two determinations gives the amount of nitrogen due to amino-acids.

J. J. S.

Action of Iodic Acid on Uric Acid. Estimation of Uric Acid. By H. BOUILLET (*Bull. Soc. Chim.*, 1901, [iii], 25, 251—255).—When uric acid is heated with excess of iodic acid in aqueous solution, it is completely decomposed into mesoxamide, carbamide, carbon dioxide, and ammonia, 1 mol. of iodine being also liberated for every 5 mols. of uric acid. If, however, the theoretical amount of iodic acid

is employed, the reaction is incomplete and alloxan is formed. Use is made of the first reaction for the estimation of uric acid in urine, but instead of distilling the precipitated barium urate with iodic acid solution and estimating the iodine in the distillate, as in Causse's process, the author prefers to remove the liberated iodine by boiling the liquid, and estimate the undecomposed iodic acid by adding potassium iodide and titrating with thiosulphate solution. The test analyses quoted are very satisfactory. N. L.

Detection of Cinnamic Acid in the Presence of Benzoic Acid. By ARMAND JORISSEN (*Ann. Chim. anal. appl.*, 1901, 6, 41—43).—After mentioning the permanganate test, the author describes a new reaction for the detection of cinnamic acid in officinal benzoic acid. One gram of the sample is dissolved in 10 c.c. of boiling distilled water; when cold, the liquid is filtered and the filter containing the benzoic acid is gently pressed. To the filtrate are now added 4 c.c. of a 5 per cent. aqueous solution of uranium acetate, and after closing the glass tube with a cork the liquid is exposed to light (preferably direct sunlight). Gradually, benzaldehyde is formed, easily recognisable by its odour. One per cent. of cinnamic acid may be thus detected; if large quantities are present, it is sufficient to mix a few decigrams of the sample with a few c.c. of the uranium solution, and to expose the mixture to light. L. DE K.

Detection and Estimation of Salicylic Acid in Wines. By ANTONIO J. FERREIRA DA SILVA (*Ann. Chim. anal. appl.*, 1901, 6, 11—12. Compare Abstr., 1900, ii, 695).—A reply to Pellet (this vol., ii, 207). The method proposed by Pellet and Grobert for the detection of salicylic acid in wines, although an excellent one for quantitative purposes, may sometimes show traces of this substance when it is really absent. L. DE K.

Composition of the Milk of Indian Cows and Buffaloes. By J. WALTHER LEATHER (*Analyst*, 1901, 26, 40—42).—Four tables are given showing the results of the analyses of milk of a large number of Indian cows from different localities and also of buffaloes' milk. The analysis includes the fat, proteids, lactose, and ash.

The milk from the Indian cows was found not to differ from rich English milk. The relation between the lactose, proteids, and ash agrees well with the proportions 13:9:2, and the non-fatty solids agree fairly well with those obtained by calculation, using Richmond's formula.

The samples of buffaloes' milk were characterised by an unusually high percentage of fat, 7 to 8 per cent. being common. The relation between the lactose, proteids, and ash is about 10:12:2 and the non-fatty solids agree also fairly well with those obtained by calculation. L. DE K.

Refractive Power, Amount of Volatile Fatty Acids, and the Iodine Number of Butter Fat. By E. HOLM, A. V. KRARUP, and P. V. F. PETERSEN (*Bied. Centr.*, 1901, 30, 48—57; from 40^{de} Beretn. k. Vet. Landbohøjskoles Lab. landök. Forsög. Copenhagen, 1900, 1—46 and tables 1—56).—During four years (1895—1900), 7834

samples of butter, from 800 dairies, were examined. The refraction numbers of single samples varied from 48.6 to 54.9, but the average results for single dairies varied only between 50.2 and 52.9. As regards the influence of season, it is shown that from December to October there was a gradual increase from 50.2 to 52.8; in November there was a sudden fall to 51.0. In employing the refraction number as a criterion of purity, the time of year must, therefore, be taken into account.

In the case of samples of butter made at the same time, the amounts of fat and volatile fatty acids decrease as the refraction numbers increase. The variations are slight when the refraction numbers are between 48 and 51, but greater when the refraction numbers rise to 52—55.

The iodine numbers vary in accordance with the refraction number. The examination of butter from single cows showed that there may be considerable variations. The differences found at times in Danish butters may therefore be due to the nature of individual cows, and not to adulteration.

N. H. J. M.

Analysis of Butter Fat. By W. VON KIENZE (*Chem. Centr.*, 1901, i, 479; from *Zeit. landw. Versuchs-Wes. Oesterr.*, 1901, 4, 77—80).—Higher figures are obtained when using the Leffmann-Beam method instead of the Reichert-Meissl process, the difference amounting to from 0.5 (or less) to 1.4 c.c. of *N*/10 alkali, and this is held to be caused by action of the alkaline glycerol on the non-volatile acids whereby volatile acids are generated. A copper distilling flask is preferred.

L. DE K.

Amount of Volatile Fatty Acids in Dutch Butters. By LODEWYK TH. REICHER (*Zeit. angew. Chem.*, 1901, 125—127).—A large number of experiments are given extending over 7 years, showing that the Reichert-Meissl number of genuine Dutch butters may frequently fall below 25. Compare Kirchner and Racine (this vol., ii, 137).

L. DE K.

Halphen's Reaction for Cotton Seed Oil and the Behaviour of some American Lards towards the Same. By PAUL SOLTSIEN (*Zeit. öffentl. Chem.*, 1901, 7, 25—27).—The author now agrees that the use of amyl alcohol in the Halphen's test is advantageous, and heats the fat or oil to be tested for cotton seed oil with 20 per cent. of a 1 per cent. solution of sulphur in carbon disulphide, then adding half the volume of amyl alcohol. He has made a further improvement by not excluding the light during the heating in boiling water.

Several samples of genuine American lard which gave a decided Halphen test are supposed to be derived from pigs fed on cotton seed meal. Further experiments in that direction are promised.

L. DE K.

Examination of Varnish Resins. By JULIUS LEWKOWITSCH (*Analyst*, 1901, 26, 37—38).—The author has determined the acid and saponification numbers, unsaponifiable matter, iodine number (by

both iodine chloride, and bromine methods) and solubility in alcohol of several resins used in varnish making and has tabulated the results. As the resins are, however, not used in their natural state, but after having been submitted to a high temperature, the author has also determined the constants after heating the resins at 300°.

The following articles were tested : 6 samples of copal, 2 of sandarac, 2 of animi, 1 of kauri gum, 1 of mastic, 1 of dark shellac, 1 of dammar, 1 of amber, 1 of succinite (a species of amber) and 1 of ordinary rosin. The results show that these methods are of scarcely any practical use to analysts engaged in varnish testing.

L. DE K.

Detection of Antithermic Substances in Urine. By ARTHUR PETERMANN (*Ann. Chim. anal. appl.*, 1901, 6, 4—6).—Antithermic drugs are often administered to cattle to defeat the obligatory tuberculin test. Some of these, such as sodium salicylate, salol, and ethyl salicylate, decompose in the body and yield salicylic acid, which partially passes into the urine; antipyrine may also be detected in the urine.

Detection of salicylic acid.—The urine, if not already acid, should be feebly acidified with hydrochloric acid, and to 25 c.c. of the sample is then added one drop of a 10 per cent. solution of ferric chloride, when in the presence of salicylic acid the characteristic violet colour will make its appearance; it is discharged on adding more hydrochloric acid. *Detection of antipyrine.*—If the colour, instead of being violet, is blood-red, there is a likelihood of antipyrine being present; this is then tested for as usual by agitating the urine with chloroform or benzene.

Colouring matter in urine.—Occasionally, a clear garnet or a dark orange or intermediate colour is obtained which, however, resists the action of hydrochloric acid and finally yields a coloured precipitate.

L. DE K.

Estimation of Indican in Urine and its Clinical Significance. By WOŁOWSKI (*Chem. Centr.*, 1901, i, 425; from *Deut. med. Woch.*, 1901, 27, 23).—The method resembles that used by the author for the evaluation of bleaching powder (*Abstr.*, 1900, ii, 165). Two hypochlorite solutions are used: the first contains 1 per cent. of active chlorine, the second 0.1 per cent., and they are contained in burettes which deliver 1 c.c. in exactly 20 drops. Ten c.c. of a 25 per cent. lead acetate solution are made up to 100 c.c. with the urine. The mixture is filtered, and 5 c.c. of the filtrate placed in each of five narrow test-tubes. These are treated with the hypochlorite solutions, beginning with 1 drop of the stronger, and rising by regular differences of 5 drops of the weaker. After 2 minutes, 5 c.c. of hydrochloric acid are added to each tube, and then 1 c.c. of chloroform. With normal indicanuria, the colour communicated to the chloroform should increase as far as the third tube, that in the fifth should be colourless. With hyperindicanuria, the colour will increase as far as the fifth tube. In that case, a fresh series is made with larger amounts of hypochlorite, until a point is reached at which the chloroform remains colourless. With hypoidicanuria, the chloroform will sometimes be colourless in the first tube. The tube giving the

strongest colour indicates the amount of indican present. The chlorine there employed is then multiplied by 0.025, and the total daily excretion of indican calculated. It is important to compare this with the total solids excreted; the latter may be calculated by the use of Haeser's factor; the excess of sp. gr. above unity $\times 2.33 =$ grams of solid matter per litre. In normal indicanuria, there should be present 0.1 mg. of indican for each gram of total solids. The clinical significance of the indican coefficient is discussed in the original paper.

M. J. S.

New Tannin Estimations. By LEOPOLD SPECHT and FRITZ LORENZ (*Chem. Zeit.*, 1901, 25, 5—6).—A mathematical and chemical investigation as to the merits of the safranine process for the estimation of tanning materials (*Abstr.*, 1900, ii, 515). It is shown that concordant results are obtainable when the directions are properly followed.

The best proportions for standardising the hyposulphite solution are: 0.45 gram of pure tannic acid, 0.54 gram of potassium-antimonyl tartrate, and 0.9 gram of safranine T in 1500 c.c. of water, to which are then added 35 c.c. solution of sodium hydrogen sulphite (of 1.96 sp. gr.), 1:10, and 33 c.c. solution of sodium hydrogen carbonate, 1:10. The mixture is then treated as previously directed. When testing the sample, it is advisable to take such a quantity as will represent as nearly as possible the same amount of tannin as used in the check experiment.

L. DE K.

Estimation of Tannic Acid, Organic and Mineral Acids in Tan Liquor. By FERDINAND JEAN (*Chem. Centr.*, 1900, ii, 1298; from *Ann. Chim. anal. appl.*, 5, 413).—The total acid is titrated with *N*/20 alkali, using lacmoid paper. A second portion is accurately neutralised with *N*/10 sodium carbonate, then mixed with 15 c.c. of a 2 per cent. solution of albumin, boiled, filtered, and the excess of alkali in the filtrate titrated at boiling temperature. The difference gives the tannic acid. In a third portion, tannic and gallic acids are precipitated by adding zinc oxide to exact neutrality, the precipitate is collected, washed with hot water, boiled with 20 c.c. of *N*/10 sodium carbonate, the zinc carbonate filtered off, and the excess of soda in the filtrate titrated. The difference from the second titration gives the gallic acid, that from the first the organic and mineral acids. A fourth portion is evaporated in platinum with 20 c.c. of *N*/10 sodium carbonate and incinerated. The ash is dissolved in water and titrated; the soda consumed indicates the mineral acid present, unless salts of organic acids are also present. In this case, a fifth portion is neutralised with baryta, boiled, filtered, and in the ash of the filtrate the alkali soluble in water is titrated with *N*/10 sulphuric acid.

M. J. S.

Analyses of Fruit Juices. By EDUARD SPAETH (*Zeit. Nahr.-Genussm.*, 1901, 4, 97—107).—A large number of analyses are given of pure and adulterated raspberry syrups. The chief object has been to detect whether for the preparation of the syrup a genuine raspberry juice or a diluted article has been used. The syrup is

generally made by bringing to the boil 35 parts of raspberry juice and 65 parts of cane sugar.

In a genuine article, the amount of ash obtained from 100 grams should not fall below 0.2 gram, and this should require for neutralisation not less than 2 c.c. of normal acid. The sugar free extract should not be less than 1.3 per cent. The acidity of the sample also affords a useful clue; 100 grams should require from 7.35 to 12.8 c.c. of *N* potassium hydroxide.

L. DE K.

Analysis of Chicory Root. By JULES WOLFF (*Ann. Chim. anal. appl.*, 1901, 6, 8—10. Compare *Abstr.*, 1900, ii, 37).—*Experiment with the juice.* 20—25 grams of the desiccated juice are dissolved in water, diluted to 100 c.c., acidified with a few drops of sulphuric acid, and fermented with yeast at 27°. The alcohol is then distilled off and estimated as usual. The residue in the distilling flask is made up to 100 c.c., a few more drops of sulphuric acid are added, and the contents heated for 15 minutes in the water-bath to complete the inversion of the inulin. When cooled, it is again fermented with yeast and the alcohol once more estimated. In this way, the author found the proportion between the alcohol derived from the readily fermentable matter and the same from the indirectly fermentable substance to be 1.70 : 1.

Experiment with the pulp.—(a) Sixteen grams of the dry pulp are heated in a 200 c.c. flask with 150 c.c. of water for 2 hours in the water-bath at 80°; when cooled to 27°—29°, it is fermented with yeast, and afterwards heated on the water-bath to expel the alcohol and the carbon dioxide. When cold, the liquid is made up to 200 c.c., filtered, and quantitatively tested for lævulose, both optically and with Fehling's solution. (b) Another portion of the sample is then treated in the same manner, but without previous fermentation. In this way, the author obtained for *b* the figure 66 and for *a* the figure 24.3, leaving 41.7 per cent. of inulins convertible into lævulose.

L. DE K.

The Precipitation of Albumin in Urine by Clarifying Agents. By BRUNO GRÜTZNER (*Chem. Centr.*, 1901, i, 479; from *Pharm. Zeit.*, 1901, 46, 77—78).—The author states that the clarifying agents used in the analysis of urine, such as magnesium oxide, aluminium hydroxide, talc, lead peroxide, and even "kieselguhr," all precipitate notable quantities of albumin. The best way to get a clear sample is to allow it to settle, remove the supernatant liquid with a pipette, and then to filter through a double filter. Another good plan is to shake the sample with pulped and then redried blotting paper.

L. DE K.

Action of Hydrogen Peroxide on Blood. Easy Means of Differentiating the Blood of Man from that of Animals. By S. COTTON (*Bull. Soc. Chim.*, 1901, [iii], 25, 255—257).—Quantitative study of the well known reaction between blood and hydrogen peroxide shows that it affords a ready means of distinguishing the blood of man and other animals. The following volumes of oxygen were evolved from 1 c.c. of defibrinated blood on treatment with 250 c.c. of 12 volume hydrogen peroxide: man, 580—610 c.c.; horse,

320—350 c.c. ; pig, 320—350 c.c. ; ox, 165—170 c.c. ; guinea pig, 115—125 c.c. ; sheep, 60—65 c.c. Slight differences are observed in favour of young and female animals, and blood which has been exposed to the air for a few hours yields more oxygen than either fresh blood or blood which has been exposed for a long time. The yield of oxygen is decreased in certain diseases, or by dilution with water. N. L.

Value of the Hæmatoporphyrin Test for the Forensic Detection of Blood. By CARL IPSEN (*Chem. Centr.*, 1900, ii, 1217 ; from *Vierteljahrschr. ger. Med. u. öffentl. Sanitätswesen*, 20, 1—11).—The author confirms the work of Kratter (*ibid.*, 1892, 4, 62), who stated that the spectroscopic hæmatoporphyrin test for blood answers very well for blood spots which have been subjected to a high temperature and are singed or charred, also for spots which are dried or have putrefied.

A microscopical examination of such blood spots will occasionally give a clue to the origin of the blood as shown by the presence of foreign particles. L. DE K.

Hæmin Crystals. By MAX RICHTER (*Chem. Centr.*, 1900, ii, 1215 ; from *Vierteljahrschr. ger. Med. u. öffentl. Sanitätswesen*, 20, 22—39).—The difficulty occasionally experienced in the detection of hæmin in blood is caused by the lessened solubility in acetic acid. The age of the blood spots, also the nature of the fabric, have in many cases a distinct bearing on the negative result of the hæmin test as the change of hæmoglobin into hæmin is accelerated or retarded.

The author advises waiting until the hæmochromogen has changed into hæmatin before proceeding to the hæmin test. L. DE K.

Detection of Bilirubin by Ehrlich's Diazo-reaction. By FR. PRÖSCHER (*Chem. Centr.*, 1901, i, 596 ; from *Centr.-Bl. inn. Med.*, 22, 169).—The diazo-reaction (Abstr., 1900, i, 571), which is a very sensitive test for bilirubin, is not produced by other bile pigments, such as bilifuscin, bilihumin, &c. On adding Ehrlich's reagent (Abstr., 1900, ii, 776) to a hydrochloric acid solution of bilirubin, the liquid becomes blue, and on making alkaline with dilute potassium hydroxide the colour changes to green ; in neutral solution, it is red. The author precipitates the bilirubin from 10 c.c. of urine by Méhu's method of saturating with ammonium sulphate, collects the precipitate on a filter, from which it is then dissolved by 96 per cent. alcohol, and uses the alcoholic solution strongly acidified with hydrochloric acid for the above reaction. The dilute potassium hydroxide should be poured carefully into the test tube, when at the point of contact a multi-coloured ring is formed in which the colours are in the order blue, red, and green.

The urine of icteric patients contains substances which interfere with the above reaction. M. J. S.

General and Physical Chemistry.

New Method of Characterising Colouring Matters : Application to Indophenols. By CHARLES CAMICHEL and PIERRE BAYRAC (*Compt. rend.*, 1901, 132, 882—885).—The authors have examined the absorption spectra of a large number of indophenols dissolved in alcohol, ether, carbon disulphide and chloroform respectively. When the wave-lengths are plotted as abscissæ and the coefficients of transmission as ordinates, a parabola is obtained with the convexity away from the axis of the abscissæ. The part of the curve corresponding with the red rays is much steeper than that corresponding with the green and blue rays, and the position of the minimum ordinate lies between $\lambda 610$ and $\lambda 535$, according to the nature of the indophenol and of the solvent. The lowest point of the curve, which corresponds with the minimum of transparence, and is the characteristic point, is accurately determined by means of a series of chords drawn parallel with the axis of the abscissæ. The position of the minimum of transparence is independent of the concentration of the solution for all compounds the coefficient of absorption of which is proportional to the concentration in accordance with Beer's law, but it varies with the nature of the solvent according to a law which is not, however, Kundt's law. The minimum is nearest to the red end of the spectrum when alcohol is the solvent, and nearest to the blue end when ether is the solvent. In chloroform, the minimum is nearer to the blue end than in alcohol, and in carbon disulphide it is nearer to the red end than in ether. Substitution of primary nitrogen for tertiary nitrogen displaces the minimum towards the blue end of the spectrum, whatever may be the solvent. A substitution in the ortho-position in the phenol from which the indophenol is derived causes a considerable displacement of the minimum of transparence, whilst a similar substitution in the meta-position causes little or no displacement (compare this vol., i, 296 ; ii, 100, 232). C. H. B.

Illumination of Different Kinds of Glass. By WALTHER SPRING (*Rec. Trav. Chim.*, 1900, 19, 339—349).—Ruby-glass is made by the addition of traces of gold chloride to an ordinary fused glass ; the glass so obtained is at first colourless and only assumes a ruby colour during subsequent prolonged heating. When an intensely luminous electric beam is passed tangentially through a small cylinder of the colourless gold-glass, practically no internal illumination is visible ; in the case of the ruby-glass, however, a yellowish-brown, luminous trace is produced, probably due to reflection from minute particles of metallic gold. The intensity of colour of the ruby-glass depends on the time of its reheating, and determines the intensity of illumination necessary to produce a visible trace ; the deeper the colour of the glass the less illumination is required. In the colourless glass, the gold probably exists in a state of extreme subdivision, and the reheating which produces the ruby colour brings about a coarser

colloidal aggregation, similar to that which takes place in gelatino-bromide plates during maturation (de Bruyn, *Rec. Trav. Chim.*, 1900, 19, 236).

Red glass coloured by copper, and yellow glass coloured by silver, show respectively dull brown and greyish luminous traces, due to the finely divided metals. Glasses coloured by silicates of iron, chromium, manganese, and cobalt show only a faint luminous trace, and, allowing for the presence of small air bubbles, are optically "void" (*vide*). Glasses which are colourless of themselves show a faint bluish trace and are yellow when viewed through a great length; they thus resemble media containing an extremely minute turbidity (compare Abstr., 1899, ii, 537, 585). Glass decolorised by manganese compounds shows an intensely green fluorescence, the luminous trace being green when the incident light is either violet or blue, but suppressed when it is green, yellow, or red. Glasses containing iron alone or manganese alone are not fluorescent.

W. A. D.

Apparatus for the Observation of Fluorescence and Opalescence. By M. TSVETT (*Zeit. physikal. Chem.*, 1901, 450—452).—A simple form of apparatus is described in which no lens is employed, the light being reflected upwards into a test-tube containing the liquid. With it eosin is seen to render water fluorescent even at concentrations of $1/10^9$.

L. M. J.

Induced Radioactivity and Gases made Active by Radium. By P. CURIE and A. DEBIERNE (*Compt. rend.*, 1901, 132, 768—770).—When a substance to be made radioactive, such as copper, is sealed up in a glass tube with the exciting radioactive substance, it gradually acquires a limited degree of radioactivity which is independent of the pressure and of the chemical nature of the gas in the tube. If, however, the pressure in the tube is extremely low and the vacuum is maintained during the experiment by the continued action of the pump, the substance does not become radioactive, and in the same conditions a substance which has previously been excited loses its activity. On the other hand, if the tube containing the radioactive substance and the other substance is made vacuous and then sealed up, excitation takes place after a time and reaches the same limit as under other conditions, whilst gas is evolved by the radioactive substance and produces a small pressure in the tube. If the radioactive substance is heated in a vacuum, the evolved gas can be collected. Although small in quantity, it is intensely radioactive, makes the glass of the containing tube luminous in the dark, acts instantly on photographic plates, and very rapidly discharges an electrified body. The glass of the tube that contains it soon becomes black (compare Abstr., 1900, ii, 125). The intensity of the radioactivity of this gas diminishes continuously, but very slowly; it is always very strongly active even ten days after it has been collected. It is noteworthy that the air of the laboratory in which these experiments have been carried on for some years has gradually acquired a higher and higher conductivity for electricity, a result which is probably due mainly to the continuous formation of radioactive gases analogous to those just described.

When hydrated barium chloride is heated in a vacuum, the water collected is radioactive, but when evaporated leaves no residue of a radioactive solid. If kept in a sealed tube, its radioactivity very slowly disappears.

C. H. B.

Dielectric Constants of Nitriles. By HERMAN SCHLUNDT (*J. Physical Chem.*, 1901, 5, 157—169).—Solutions of salts in acetonitrile, propionitrile, and benzonitrile have a considerable electrical conductivity (see Dutoit and Friderich, *Abstr.*, 1899, ii, 350; Kahlenberg and Lincoln, *Abstr.*, 1899, ii, 397; Lincoln, *Abstr.*, 1900, ii, 6). In applying to these substances Nernst's rule of the connection between the dielectric constant of a solvent and its dissociating power (see *Abstr.*, 1894, ii, 266), the author has determined the dielectric constants of the following liquids at about 21° by Drude's method (*Abstr.*, 1897, ii, 438): hydrocyanic acid, 95; acetonitrile, 36.4; propionitrile, 26.5; butyronitrile, 20.3; isopropionitrile, 20.4; valeronitrile, 17.4; isovaleronitrile, 17.95; hexonitrile, 15.5; benzonitrile, 26.0; phenacetoneitrile, 14.9; *o*-toluonitrile, 18.4; pyridine, 12.4; quinoline, 8.8. The author concludes that Nernst's rule holds at best only for members of the same homologous series. The dielectric constant of a solvent is not the sole factor determining whether solutions in that solvent will conduct electricity or not.

J. C. P.

The Nernst Formula for the E.M.F. of Concentration Elements. By HANS JAHN (*Zeit. physikal. Chem.*, 1901, 453—460).—The formula given by Arrhenius (this vol., ii, 144) for the *E.M.F.* of a concentration element is open to the objection that for concentrated solutions the transport numbers and isotonic coefficients are not known. For dilute solutions, however, it is shown that the formula becomes identical with that of Nernst, which Arrhenius held to be incorrect. The formula of Helmholtz also reduces to the Nernst expression for dilute solutions. The author again contests the supposition that the ratio μ/μ_∞ is a measure of the dissociation (*Abstr.*, 1900, ii, 522, 707).

L. M. J.

Autoxidation and its Connection with the Theories of Ions and of the Galvanic Cell. By FRITZ HABER (*Zeit. Elektrochem.*, 1901, 7, 441—449).—The typical reaction in cases of wet autoxidation is, taking lead as an example, $\text{Pb} + \text{H}_2\text{SO}_4 + \text{O}_2 = \text{PbSO}_4 + \text{H}_2\text{O}_2$. This reaction may be caused to take place in a galvanic cell in which the anode consists of lead dipping into a saturated solution of lead sulphate in sulphuric acid. The change taking place at the anode is represented by the equation $\text{Pb} + 2F(+) = \text{Pb}\cdot\cdot$ ($F = 96540$ coulombs). The change occurring at the cathode would be $\text{O}_2 + 2\text{H}\cdot - 2F(+) = \text{H}_2\text{O}_2$; such cathodes have been devised by Traube and by Richarz and Lonnes. The total change in the cell would be represented by the equation $\text{Pb} + \text{O}_2 + 2\text{H}\cdot = \text{Pb}\cdot\cdot + \text{H}_2\text{O}_2$, or, adding the SO_4'' ions to each side of the equation, $\text{Pb} + \text{O}_2 + \text{H}_2\text{SO}_4 = \text{PbSO}_4 + \text{H}_2\text{O}_2$. The *P.D.* at the anode is about 0.284 volt in normal sulphuric acid; that at the cathode depends on the concentration of the hydrogen peroxide and may be taken to be about -0.8 volt. (The potential of the hydrogen electrode is taken

as zero in both cases.) The autoxidation cell would therefore have an *E.M.F.* of about 1 volt.

According to Traube, the typical wet autoxidation is represented by the equation $M + 2HO\cdot H + O_2 = M(OH)_2 + H_2O_2$. When the electrolytic dissociation of water is taken into account, this equation obviously represents a mechanism identical with that of the autoxidation cell. The theories of Engler and Wild and of Bach assume a different mechanism.

The fact that a solution of hydrogen peroxide is metastable, and decomposes completely into water and oxygen under the influence of catalytic agents, appears at first sight inconsistent with the fact that the *P.D.* of the hydrogen peroxide electrode is *lower* than that of the oxygen electrode. The potential is, however, determined by the reversible change which takes place at the electrode, in this case $2H\cdot + O_2 + 2F(-) \rightleftharpoons H_2O_2(a)$. An electrode at which the (as yet unrealised) reaction $2OH\cdot + 2F(+) \rightleftharpoons H_2O_2(b)$, occurred would have a higher potential than the oxygen electrode, because the production of electrical energy by the combination of oxygen and hydrogen to form water may take place in one stage, represented by the equation $H_2 + O_2 = 2H_2O + 2(1.1 \times 2F)$, or in two stages represented by the equations (a) $H_2 + O_2 = H_2O_2 + 0.8 \times 2F$, and (b) $H_2O_2 + H_2 = 2H_2O + 2(1.3 + 2F)$.

The author considers that the different theories of wet and dry autoxidation may be reconciled with each other and with his results in the following statement. Oxygen always combines in undivided molecules. In dry processes, it unites with the oxidisable substance; in the typical wet processes, it combines with two hydrogen ions which part with their charges, two positive charges being simultaneously taken up by the oxidisable substance.

It is shown, also, that similar conclusions are reached by setting out from Nernst's formula for the potential of the oxygen electrode or from the hypothesis that the oxygen molecules first split up into oxygen atoms. This last assumption, however, agrees with the facts only when it is supposed that the formation of atoms from molecular oxygen is a slow process; this gives a plausible explanation of the fact that in dry autoxidations reactions of the type $M + O_2 = MO_2$ are more common than those of the type $M + O = MO$.

By the theory here developed, it is possible to predict the behaviour of most substances towards oxygen. Base metals and reducing agents, combined with an oxygen electrode, will give cells with a considerable *E.M.F.*, and such substances will undergo typical autoxidation; with more noble metals, the *E.M.F.* will be smaller; it becomes almost zero with mercury. With metals such as gold and platinum, and still more with substances giving high negative potentials, such as manganese dioxide, lead dioxide, &c., the reaction will be reversed, and instead of the change $M + O_2 + 2H\cdot = M\cdot\cdot + H_2O_2$, the reaction $M\cdot\cdot + H_2O_2 = M + O_2 + 2H\cdot$ will take place.

T. E.

Influence [of Benzyl Alcohol] on the Potential of Oxidation Cells. By KARL SCHAUH (*Zeit. Elektrochem.*, 1901, 7, 483—484).—The conversion of an alkali sulphite into a sulphate appears to take place

reversibly in accordance with the reaction $\text{SO}_4'' + 2\text{H}(-) \rightleftharpoons \text{SO}_3' + \text{O}''$ (compare preceding abstract) at a platinum electrode immersed in a solution containing a mixture of sulphate and sulphite to which a drop of benzyl alcohol has been added. The reaction is not reversible in absence of the benzyl alcohol. The potentials of the electrodes are measured.

T. E.

Electrochemical Relations between the Allotropic States of Metals, and especially of Silver. By MARCELIN P. E. BERTHELOT (*Compt. rend.*, 1901, 132, 732–734).—When a plate of hammered silver foil and a plate of any of the other modifications of silver previously described (this vol., ii, 156) are immersed in a 10 per cent. solution of silver nitrate and connected externally with a conducting wire, an electric current is produced, the hammered silver foil being always positive with respect to the other modifications, which is in agreement with the thermochemical results (*loc. cit.*). After some time, the current ceases, either because both plates are brought to the same conditions, at the surface, by the deposition of silver from the solution, or because the other modification is brought superficially into the same condition as the hammered foil.

C. H. B.

Electromotive Behaviour of Substances with several Stages of Oxidation. II. By ROBERT LUTHER (*Zeit. physikal. Chem.*, 1901, 385–404. Compare Abstr., 1900, ii, 705).—The various oxidation changes of chromium yield various *E.M.F.*'s and the following values are calculated: $\text{Cr}_{\text{metal}} \rightarrow \text{Cr}^{\cdot\cdot}$, +0.3 volt; $\text{Cr}_{\text{metal}} \rightarrow \text{Cr}^{\cdot\cdot\cdot}$, +0.2 volt; $\text{Cr}_{\text{metal}} \rightarrow \text{CrO}_4''$, -0.9 volt; $\text{Cr}^{\cdot\cdot\cdot} \rightarrow \text{CrO}_4''$, -1.8 volts; $\text{Cr}^{\cdot\cdot} \rightarrow \text{Cr}^{\cdot\cdot\cdot}$, +0.1 volt; $\text{Cr}^{\cdot\cdot} \rightarrow \text{CrO}_4'$, -1.4 volts. It is shown that if the intermediate oxidation compound exists under the experimental conditions, this compound is a stronger oxidising agent than the highest oxidation product and a stronger reducing agent than the lowest, and numerous examples are added. The equilibrium of cuprous and cupric salts in the presence of copper was investigated and the equilibrium constant deduced; $\text{Cu}^{\cdot\cdot}/\text{Cu}^2 = 1.5 \times 10^6$ at 25° , and from this the dissociation in saturated solution of cuprous salts is calculated, the values found being $\text{Cu} \times \text{Cl}' = 2.2 \times 10^{-7}$, and $\text{Cu} \times \text{Br}' = 8.2 \times 10^{-9}$. For the equilibrium concentrations, the *E.M.F.*'s for each change $\text{Cu} \rightarrow \text{Cu}^{\cdot}$, $\text{Cu} \rightarrow \text{Cu}^{\cdot\cdot}$, and $\text{Cu}^{\cdot\cdot} \rightarrow \text{Cu}^{\cdot\cdot\cdot}$ must be equal, and this was verified. The *E.M.F.* for $\text{Hg} - \text{HgCl}_2$ was calculated as 0.750 volt, and from this by independent methods the dissociation constant was deduced, the values obtained being 1.5×10^{-14} and 0.18×10^{-14} .

L. M. J.

Electrochemical Studies of the Solubility of Precipitates containing Heavy Metals. By CL. IMMERWAHR (*Zeit. Elektrochem.*, 1901, 7, 477–483).—The *P.D.*'s between electrodes of mercury, copper, lead, cadmium, and zinc and saturated solutions of their less soluble salts were measured. The saturated solutions were obtained by precipitating the salts of the heavy metal with an excess of the reagent. From the potential difference, the concentration of the ions of the heavy metal in the solution may be calculated, and since the same excess of reagent was used in all cases, these concentrations are proportional to the solubility of the salts. Several salts gave values

varying between definite limits, corresponding doubtless with different conditions of the precipitate. The following table gives the order of solubility of the salts examined, the most soluble heading the list :

Mercurous salts.	Cupric salts.	Cuprous salts.	Lead salts.	Cadmium salts.	Zinc salts.
Chromate.	Carbonate.	Chloride.	Chloride.	Chloride.	Iodide.
Phosphate.	Hydroxide.	Bromide.	Bromide.	Bromide.	Bromide.
Carbonate.	Oxide.	Iodide.	Thiocyanate.	Iodide.	Chloride.
Chloride.	Cyanide.	Thiocyanate.	Chromate.	Chromate.	Chromate.
Thiocyanate.	Sulphide.		Iodide.	Phosphate.	Phosphate.
Bromide			Phosphate.	Hydroxide. ¹	Hydroxide.
Oxide.			Carbonate.	Carbonate.	Carbonate.
Iodide.			Cyanide.	Cyanide.	Cyanide.
Cyanide.			Hydroxide?	Hydroxide. ²	Sulphide.
Sulphide.			Sulphide.	Sulphide.	

(¹) Initial value.

(²) Final value.

T. E.

Laboratory Apparatus for Decomposition Voltages. By WILDER D. BANCROFT (*J. Physical Chem.*, 1901, 5, 133—136).—By means of a modified form of Le Blanc's method, the conditions under which metals can be separated, the existence of a complex ion, the conditions for a crystalline deposit, &c., can be easily investigated.

In the main circuit containing the electrolytic cell is interposed a mil-ammeter and the electrodes are connected with a high resistance voltmeter having a contact-key in this circuit. The voltmeter should be placed in series with another high resistance and under these circumstances the resistance of the solution can be neglected. The electrodes are platinum wires and the cell may be in the form of a beaker or a U-tube.

The measurements made are potential differences and not electromotive forces of polarisation. The value of the decomposition voltage can be arrived at by extrapolation to the point of zero current. The measurements are probably correct to about 1/50 volt.

The results obtained with solutions of zinc sulphate and sulphuric acid agree well with those found by Le Blanc.

J. McC.

An Improved Melting Point Apparatus. By FREDERICK W. STREATFIELD and J. DAVIES (*Chem. News*, 1901, 83, 121).—To avoid inconvenience arising from acid fumes or from spirting or from the absorption of atmospheric moisture when taking melting points in sulphuric acid, the authors use a light dome-shaped glass cover of a size to rest lightly on the rim of an ordinary narrow beaker and furnished with two tubulated orifices for the passage of the thermometer and stirrer respectively.

D. A. L.

Specific Heat of a Gaseous Mixture of Compounds in Chemical Equilibrium. By A. PONSOT (*Compt. rend.*, 1901, 132, 759—761).—A continuation of the author's previous paper (this vol., ii, 84), in which it is now deduced that the system the formation of which causes an increase of volume is that which tends to solely form the mixture when the temperature increases without limit either at constant volume or constant pressure. Its formation further

increases the specific heat of the mixture, this increase being greater at constant pressure than at constant volume. L. M. J.

Determination of the Specific Heats of Metals by their Rate of Cooling. MISS A. SERDOBINSKY and MISS A. EMELIANOFF (*J. Russ. Phys. Chem. Soc.*, 1901, 33, ii, 23—28).—For the determination of the specific heat of a metal, the authors use a horizontal wire, the ends of which are fixed in rigid supports whilst the middle point is loaded to keep it taut. The wire is heated by the passage of a known current and then allowed to cool, the temperature at any instant being known from the length of the wire, which in its turn is calculated from the sag of the middle point. The authors' measurements yield for the mean specific heat of platinum the values 0.0319 and 0.0318. T. H. P.

Thermodynamical Observations. By HENRY J. S. SAND (*Zeit. physikal. Chem.*, 1901, 36, 499—507).—A discussion of the papers of Jahn (Abstr., 1900, 522, 707), Lehfeldt (this vol., ii, 4), and of Arrhenius (this vol., ii, 144) concerning the *E.M.F.* of concentration chains. L. M. J.

Thermochemistry of the Alloys of Copper and Zinc. By T. J. BAKER (*Proc. Roy. Soc.*, 1901, 68, 9—10. Compare *Proc.*, 1899, 15, 195).—By finding the difference between the heats of solution, in suitable solvents, of an alloy and of an equal weight of a mixture of the metals in the same proportions, the heat of formation of the alloy may be determined. The solvents used by the author were (1) chlorine water, (2) mixed ammonium and ferric chloride solutions, (3) mixed ammonium and cupric chloride solutions. Heat was developed in the formation of every alloy of zinc and copper tested. A maximum heat of formation (amounting to 52.5 cal. per gram of alloy) was found for the alloy with 32 per cent. of copper, corresponding with the formula CuZn_2 . The results, in general, confirm the existence of intermetallic compounds, and the values obtained are in accordance with those demanded by Lord Kelvin's calculation of the molecular dimensions of copper and zinc. [Compare Tayler, and Gladstone (Abstr., 1900, ii, 710).] J. C. P.

Dissociation and Thermochemistry of the Compound $\text{Al}_2\text{Cl}_6, 18\text{NH}_3$. By E. BAUD (*Compt. rend.*, 1901, 132, 690—692. Compare this vol., ii, 161).—The compound $\text{Al}_2\text{Cl}_6, 18\text{NH}_3$ is a very unstable substance obtained by treating the salt $\text{Al}_2\text{Cl}_6, 12\text{NH}_3$ with ammonia at -23° ; it cannot exist at the ordinary temperature, for its dissociation pressure is 760 mm. even at -14.6° , whilst at 0° the value of this constant is 1790 mm. Determinations of the dissociation pressure have also been made at other temperatures, and the results agree with the values calculated by means of Clapeyron's formula.

The specific heat of the compound is 0.4494, and its heat of solution in water is 15.88 Cal. The heat generated by the addition of 6NH_3 to $\text{Al}_2\text{Cl}_6, 12\text{NH}_3$ is 49.62 Cal., or 8.27 Cal. per mol. of ammonia; the latter value is employed in the calculation of the dissociation pressures by Clapeyron's formula. The variation of entropy deduced either from

this expression or from the curve of dissociation pressures is 32·004, a value corresponding with those obtained from other ammonio-chlorides.
G. T. M.

Heat of Fermentation. By ADRIAN J. BROWN (*J. Fed. Inst. Brewing*, 1901, 7, 93—103).—The heat of fermentation of maltose was determined to be 121·9 cal., a result in fairly close accordance with those obtained by Bouffard with dextrose (Abstr., 1896, ii, 12). As calorimeter, a large copper fermenting vessel with a capacity of 216 cubic feet was used, this was coated with a layer of wood 1 inch thick, the influence of the external temperature being thus reduced to a minimum.
R. H. P.

Depression of the Freezing Point in Solutions containing Hydrochloric and Sulphuric Acids. By JAMES BARNES (*Trans. Roy. Soc. Canada*, 1900, [ii], 6, Sec. III, 37—54. Compare Abstr., 1900, ii, 522).—If Δ be the depression of the freezing point in a mixture containing equal volumes of solutions of the two acids, and if H_2SO_4 be regarded as dissociating into 3 ions, then $2\Delta = M_1n_1(1 + a_1) + M_2n_2(1 + 2a_2)$, where M_1 and M_2 are molecular depressions, n_1 and n_2 the concentrations of the simple constituent solutions, a_1 and a_2 the ionisation coefficients in the mixture. For the latter, the conductivity of the simple constituent solutions has been determined at 0°, and a_1 and a_2 then calculated by a modification of MacGregor's method (MacGregor, *Trans. Roy. Soc. Canada*, 1896, [ii], 2, 69; Barnes, *Trans. Nova Scot. Inst. Sci.*, 1899, 10, 124). The values of Δ , calculated from the above equation, agree well, up to an average concentration of 0·2 gram-molecule per litre, with the values based on actual determination of the freezing point depression for the mixtures. The method used in the freezing point determinations was essentially that of Loomis (*Ann. Phys. Chem.*, [ii], 51, 500; Abstr., 1900, ii, 335), and the author's results for dilute solutions of both acids agree with those of Loomis better than with those of Jones.
J. C. P.

Determination of the Decrease of Vapour Tension of a Solution of Sodium Chloride at Higher Temperatures. By A. SMITS (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 3, 503—507. Compare Abstr., 1900, ii, 389, 708).—The author, by means of a Bremer oil tensimeter, has measured the decrease of vapour tension of sodium chloride solutions between 50° and 80°. The actual lowering of the vapour pressure is compared in each case with the theoretical lowering, and van't Hoff's factor i is thus determined. It is found that i increases with the concentration of the solutions.
J. C. P.

Determination of the Decrease in Vapour Tension, and of the Lowering of the Freezing Point of Solutions which are not very dilute. By A. SMITS (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 3, 507—514).—With the help of van Laar's formulæ (*Zeit. physikal. Chem.*, 1894, 15, 457) for the decrease of vapour tension and the lowering of the freezing point in solutions, the author compares Raoult's freezing point observations (see Abstr., 1899, ii, 203) with his own vapour tension results. The agreement is good in the case of sucrose, bad in the case of sodium chloride solutions. When the

values of i for sodium chloride solutions are compared, it is seen that Raoult's results show a fall in the value of i with increasing concentration, whilst the author's results point to the reverse being the case (see preceding abstract). The author considers Raoult's observations faulty, and points out that Chrustchhoff (see this vol., ii, 86) observed an increase of the molecular depression of the freezing point with increasing concentration in the case of potassium bromide solutions. It is also pointed out that there are freezing point determinations in which a minimum value of i has been found (compare Jones and Chambers, *Abstr.*, 1900, ii, 262; Chambers and Frazer, *Abstr.*, 1900, ii, 526).

J. C. P.

Vapour Tension of Ternary Mixtures. II. By FRANZ A. II. SCHREINEMAKERS (*Zeit. physikal. Chem.*, 1901, 36, 413—449).—A continuation of the extended and fuller treatment of the author's previous paper on the same subject (this vol., ii, 146; see also *ibid.*, 224).

L. M. J.

Relation between the Temperature Changes of the Specific Volumes of Liquid and Saturated Vapour. By JOHANNES D. VAN DER WAALS (*Zeit. physikal. Chem.*, 1901, 36, 461—468).—The expression for this relationship is $dv_1/\beta_1 = -dv_2/\beta_2$ where β_1 , β_2 are the compressibility coefficients at constant temperature. Although the accuracy cannot be rigorously proved experimentally, yet sufficient data are obtained from the determinations of Young and Amagat to prove at least the approximate correctness of the equation.

L. M. J.

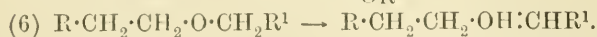
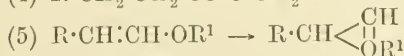
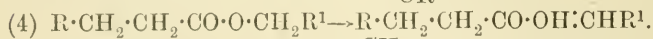
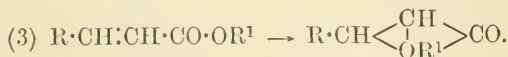
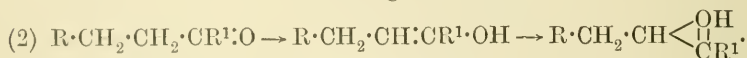
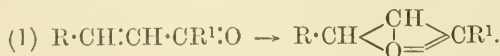
True Density of Chemical Compounds and its Relation to Composition and Constitution. II. Oxygenated Compounds. By INNOCENTIUS I. KANONNIKOFF (*J. Russ. Phys. Chem. Soc.*, 1901, 33, 61—82 and 95—127. Compare *Abstr.*, 1900, ii, 134).—The author has determined or calculated the "molecular density" (*loc. cit.*) of a large number (about 450) of oxygenated organic compounds, and from the results obtained conclusions are drawn as to their constitution. The compounds are divided into the three classes: (1) alcohols, (2) carbonyl compounds containing the group CO, and (3) ethers, comprising substances with the molecular grouping C—O—C. For each of these classes a formula has been arrived at for the molecular density, the general expression for the three classes being: $(MD) = nC + mH + pO - 27.3n - 21.7(p+1) - 3.87 - (2p^{11} - 1)3.87 + 4.84p^1 \pm x$, where n , m , and p are the numbers of atoms of carbon, hydrogen, and oxygen respectively present in the molecule; C, H and O represent the corresponding molecular densities, and have the values C=67.0, H=0.967, and O=126.44; p^1 and p^{11} are the numbers of atoms of oxygen present in the carbonyl and ether forms, and x a coefficient representing the influence of ring-formation and of multiple linking between carbon atoms; -27.3 is the change produced in the molecular density of carbon, and -21.7 in that of oxygen, when these elements enter into combination with others; -3.87 represents the influence of the formation of a chain of atoms.

The determination of the molecular density affords a good means of

deciding whether an oxy-compound has an enolic structure. Thus in the case of mesityl oxide, the molecular density has the value 316.49, the number calculated for the constitution $\text{CMe}_2\text{:CHAc}$ being 326.07; the enolic formula, $\text{CMe}_2\text{:CH}\cdot\text{C}(\text{OH})\text{:CH}_2$, however, leads to the value 316.43. The action of certain solvents in bringing about enolisation is also clearly shown by a study of the molecular density. Thus, for example, the value for acetone is 209.53, whilst 97.27 and 76.3 per cent. aqueous acetone solutions give respectively the numbers 208.72 and 198.91, the calculated value for the enolic formula for acetone, $\text{OH}\cdot\text{CMe}\text{:CH}_2$, being 198.37. Similar relations hold for other compounds containing a carbonyl group in the molecule.

In a large number of cases, however, the differences existing between the experimental and calculated numbers are too considerable to be explainable on the assumption that the compounds have an enolic structure. In such compounds, which all contain the group $\text{C}\cdot\text{O}\cdot\text{C}$, the experimental numbers are always less than the calculated, and it is found that the differences are approximately multiples of 7.74. These deviations are assumed to be due to the existence of quadrivalent oxygen atoms in the molecules of the compounds concerned. Acetone, for instance, in more dilute solutions than those mentioned above, has a less value for its molecular density than that corresponding with the enolic form. This is assumed to be due to its being converted, to a greater or less extent, into the allo-modification having the structure $\text{CMe}\begin{smallmatrix} \text{CH}_2 \\ \diagup \text{O} \end{smallmatrix}$, the calculated value for which is 184.72.

Similarly, allyl phenylpropiolate has a molecular density of 698.48, whilst the value calculated from the ordinary formula is 743.58; for the constitution $\text{C}_5\text{H}_{11}\cdot\text{O}\begin{smallmatrix} \text{CPh} \\ \diagup \text{CO} \end{smallmatrix}\text{C}$, however, the value would be 702.95. A number of other similar examples are given. The process of enolisation is thus assumed by the author to be the first phase in a structural change of the molecule, the principal types of compound undergoing such a change being the following:



With some compounds, it is necessary to assume the existence in the molecules of a sexavalent oxygen atom.

A number of alcohols, ethers, aldehydes, ketones, acids, and esters show differences between the experimental and calculated values of their molecular densities which are regarded as due to polymerisation

of their molecules, the numbers calculated from the polymeric formulæ being in good agreement with those actually obtained. Acetic acid, for example, has a molecular density 276.68, whilst the number corresponding with the constitution $\text{O} \begin{array}{c} \text{CMe}(\text{OH}) \cdot \text{O} \\ \text{CMe}(\text{OH}) \cdot \text{O} \end{array} \text{CMe}(\text{OH})$ is 277.74. Many other similar instances are given.

In a table at the end of the paper are collected for 442 oxygenated compounds the observed molecular densities, together with the values calculated according to the author's views and the percentage differences between the two sets of numbers. The agreement is in most cases very good, and in no case does the difference exceed 1 per cent.

T. H. P.

Dissociation Studies. II. By WILDER D. BANCROFT (*J. Physical Chem.*, 1901, 5, 182—192).—A paper mainly theoretical. The chief points are, (1) The displacement of equilibrium zones by catalytic agents; (2) the general discussion of systems in which three modifications occur; (3) the application of Duhem's theory to the case of acetaldehyde, based largely on the experimental work of Kekulé and Zincke (*Annalen*, 1872, 162, 125); (4) the different relative accelerating effects of different catalytic agents as shown experimentally.

J. C. P.

Dialysis in certain Liquids in which Indiarubber, but not Parchment, swells up. By AUGUSTIN WRÓBLEWSKI (*Chem. Zeit.*, 1901, 25, 222—223).—Ethereal solutions can be dialysed through a membrane of certain kinds of (pure) indiarubber; for example, from an ethereal solution of yolk of egg a yellow colouring matter diffuses out whilst lecithin remains. A rubber membrane can also be used with light petroleum; not so with benzene, in which it dissolves. In methyl, ethyl, propyl, butyl, and amyl alcohols, the rubber swells up but little and the dialysis is very slow. In chloroform and carbon disulphide, pure rubber swells up very much and readily tears.

C. F. B.

Equilibrium between Ester, Water, Acid, and Alcohol. By HANS EULER (*Zeit. physikal. Chem.*, 1901, 36, 405—412).—The constant of hydrolysis of a salt, that is, the value $C_{\text{acid}} C_{\text{base}} / C_{\text{salt}} C_{\text{water}}$ is equal to $K_4 K / K_2 K_3$ where K , K_2 , K_3 , K_4 are respectively the dissociation constants of water, acid, base, and salt. Similarly, the constant of hydrolysis of an ester should be inversely proportional to the dissociation constants of the acid and the alcohol. Determinations were made of the constants of hydrolysis for the methyl, ethyl, and propyl esters of formic, acetic, propionic, chloroacetic, and hydrochloric acids. It was found that the methyl esters were least, the ethyl esters most hydrolysed, and that the hydrolysis was greater the greater the dissociation constant of the acid. This result is not in accord with the theoretical conclusions, and the explanation given is based on the supposition that the dissociation of ester, acid, and alcohol may take place according to either of two schemes, thus, $\text{CH}_3\text{CO} \cdot \text{O}' - \text{C}_2\text{H}_5$ and $\text{CH}_3\text{CO} \cdot - \text{OC}_2\text{H}'_5$; $\text{CH}_3\text{CO} \cdot - \text{OH}'$ and $\text{CH}_3\text{CO} \cdot \text{O}' - \text{H}$; $\text{C}_2\text{H}_5 \cdot \text{O}' - \text{H}$ and $\text{C}_2\text{H}_5 \cdot - \text{OH}'$.

L. M. J.

Decomposition by Sodium of Organic Halogen Compounds dissolved in Ethyl Alcohol. By RICHARD LOWENHERZ (*Zeit. physikal. Chem.*, 1901, 36, 469—498).—The previous work (Abstr., 1900, ii, 338) has been extended to ethyl alcohol solutions and also to lithium and potassium, whilst some additional halogen compounds have also been employed, namely, *p*-bromoaniline, *p*-bromobenzoic acid, chloroform, and *p*-dibromobenzene. The results are in general similar to those previously obtained; the constant *k* is, however, smaller for lithium than for sodium, whilst for potassium it is of about the same magnitude. Satisfactory constancy is not obtained, however, for potassium, probably owing to secondary reactions. It was found that the extent of the surface of the sodium did not influence the reaction; addition of water causes a marked diminution, 2 per cent. reducing the constant by about 40 per cent. The author draws attention to the importance of such determinations in the case of many organic preparations.
L. M. J.

Tendency of the Atomic Weights to Approximate to Whole Numbers. By R. J. STRUTT (*Phil. Mag.*, [vi], 1, 311—314).—The author shows by a calculation of probabilities that the atomic weights tend to approximate to whole numbers far more closely than can reasonably be accounted for by any accidental coincidence, and believes that the complete rejection of Prout's hypothesis is unwarranted.
J. C. P.

Determination of Atomic Weights, based on the laws of the Transparence of Matter for X-Rays: Atomic Weight of Indium. By LOUIS BENOIST (*Compt. rend.*, 1901, 132, 772—774).—The method previously described (this vol., ii, 215, 216) has been applied to indium and to indium acetylacetonate, and the transparence of indium for X-rays, whether it is in the metallic state or in the form of a compound, shows conclusively that its atomic weight is 113·4, and not 75·6. This result is confirmed by the behaviour of the indium and its compound to the "soft" and "hard" X-rays respectively; it falls into the same group as silver and cadmium.
C. H. B.

Inorganic Chemistry.

Boiling Point of Liquid Hydrogen, determined by Hydrogen and Helium Gas Thermometers. By JAMES DEWAR (*Proc. Roy. Soc.*, 1901, 68, 44—54).—A constant volume thermometer, charged with hydrogen or helium, has been used. It is shown by a number of experiments that either a simple or a compound gas at an initial pressure somewhat less than one atmosphere may be relied on to determine temperatures down to its own boiling point in the constant volume gas thermometer. The mean values of separate determinations give $-182\cdot5^{\circ}$ as the boiling point of oxygen, and

—252.5° as that of hydrogen. The latter is lower than the value —238.4° previously obtained with a platinum-resistance thermometer (*Proc. Roy. Soc.*, 1898, 64, 227). J. C. P.

Preparation of Chlorine from Sodium Chlorate. Preparation of Phosphorus Trichloride. By CARL GRAEBE (*Ber.*, 1901, 34, 645—652).—The method of Gooch and Kreider (*Abstr.*, 1894, ii, 445) was modified by employing a higher temperature (compare Schacherl, this Journal, 1877, i, 47) and replacing the potassium chlorate by the more soluble sodium chlorate. A round-bottomed flask is employed, to the neck of which are sealed a delivery tube, and another tube which is bent down and dips under water, so as to serve as a safety tube; a dropping funnel passes through a cork in the neck of the flask, and has its tube drawn out at the end to a capillary tube and bent upwards. If only a comparatively small quantity of chlorine is required, as for an analytical operation, 50—55 c.c. of hydrochloric acid of sp. gr. 1.10 are placed in a flask of 70—75 c.c. capacity, whilst in the funnel, the recurved tip of which dips under the surface of the acid, a solution of sodium chlorate in water (1 : 2) is placed. The acid is heated to a temperature just below that of ebullition, and maintained at that temperature, whilst the chlorate solution is allowed to flow in at a suitable rate. For larger quantities, larger flasks are employed, and acid of sp. gr. 1.12. The heating may be continued for a little while after all the chlorate has been added; the acid can be utilised until the amount of hydrogen chloride has fallen to 5 per cent., when 16 and 20 grams of chlorine will be obtained from 100 c.c. of acid of sp. gr. 1.10 and 1.12 respectively. The gas contains about 5 per cent. of chlorine peroxide; if necessary, it may be freed from this by passing it through a glass tube heated to a dull red heat (when the gas delivered contains oxygen), or by washing it with water, 50 c.c. of which suffice for 3 grams of the gas.

In the preparation of phosphorus trichloride, it is convenient to pour some trichloride over the phosphorus before passing the chlorine in. The gas should enter the flask containing the phosphorus through a T-tube; the gas enters through the side limb, whilst a glass rod slides in the wide vertical limb, adapted to it by a cork, and serves to push down any pentachloride temporarily formed, which otherwise might block the tube. Red phosphorus may be used; there is then greater liability to blocking of the tube, but the trichloride obtained is quite free from phosphorus. With 51 grams of yellow phosphorus, 85 of phosphorus trichloride, and chlorine from 1000 c.c. of hydrochloric acid of sp. gr. 1.12 and 200 grams of sodium chlorate, the addition of the chlorate lasted an hour, and the heating was continued for 10 minutes longer; the gain in weight was equal to the theoretical, and on distilling the product 220 grams of additional trichloride were obtained. For drying the chlorine, only one wash-bottle with strong sulphuric acid was used. C. F. B.

Transformation of Hypochlorites into Chlorates. By FRITZ FOERSTER (*J. pr. Chem.*, 1901, [ii], 63, 141—166. Compare *Abstr.*, 1899, ii, 278).—In the previous paper (*loc. cit.*), it was suggested

that the conversion of hypochlorite to chlorate is effected by free hypochlorous acid, which oxidises the hypochlorite ions: (1) $\text{ClO}^- + 2\text{HOCl} = 2\text{H}^+ + 2\text{Cl}^- + \text{ClO}_3^-$. As a method is now available of estimating hypochlorous acid in the presence of hypochlorites by means of hydrogen peroxide, which only reacts with the acid, the reaction expressed by the above equation has been studied quantitatively and its velocity determined.

The known action of chlorine in effecting the transformation of hypochlorite is shown to depend on the production of free hypochlorous acid. Thus when chlorine is led into a dilute neutral solution of hypochlorite the "hypochlorite oxygen" is largely increased. (2) $\text{Cl}_2 + \text{H}_2\text{O} + \text{NaOCl} = \text{NaCl} + 2\text{HOCl}$. The double value required by the equation is never reached, as the hypochlorous acid developed converts some of the hypochlorite into chlorate, a process which plays a more prominent part the more concentrated is the original solution of hypochlorite.

Consideration of equation (1) shows that the concentration of the hypochlorous acid remains constant owing to the union of the hydrogen ions, which are produced, with hypochlorite ions already present in the solution. (3) $2\text{H}^+ + 2\text{ClO}^- = 2\text{HClO}$. The concentration of the hypochlorite ions then alone changes. Therefore from equation (1) the formation of chlorate must be a unimolecular reaction, and the velocity constant for a given concentration of hypochlorous acid must be given by the equation of the first order, $k = 1/t \cdot \log(a/a-x)$. Finally, this constant must be proportional to the square of the concentration of the acid, when this concentration is varied. The experiments of which the results are given in the paper fully confirm this view. The concentration of the hypochlorous acid remains constant until the whole of the hypochlorite has disappeared. The values obtained for k are constant for dilute solutions of hypochlorites. For higher concentrations, the hypochlorite is not initially completely dissociated; as the transformation proceeds, the proportion of the hypochlorite dissociated increases, with the result that k no longer remains constant throughout the experiment. It is further shown that the rate of the transformation increases rapidly with increase of the concentration of hypochlorous acid, and with rise of temperature. Thus for three similar solutions respectively at the temperatures 19.5° , 35° , and 49° , k has the value 0.001326, 0.00552, and 0.0205. Light accelerates the formation of chlorate, but not to a marked extent.

The influence of chlorides on the rate of transformation of hypochlorites is studied. Low chloride concentration has little influence, but higher concentrations (above $2N$) produce a marked increase in the rate. Chlorides appear to exercise a specific influence, as other normal salts, although increasing the rate of transformation (probably by causing change in the solvent), have not such marked effect.

The action of hypochlorous acid on alkali chlorides, producing chlorate and free chlorine, is discussed, and the experiments of von Tiesenholt are considered (this vol., ii, 154). The reaction is best

expressed by the equation $\text{NaCl} + 6\text{HOCl} = \text{NaClO}_3 + 3\text{H}_2\text{O} + 3\text{Cl}_2$; and it is shown that other normal salts are without action.

K. J. P. O.

Action of Ozone upon Substances containing Sulphur and upon Sulphur. By THEODOR WEYL (*Chem. Zeit.*, 1901, 25, 292).—Ozonised air was led into solutions or suspensions of various substances in water or acetic acid. With potassium thiocyanate, the solution remains clear, but sulphuric acid is formed; with diphenylthiocarbamide, sulphur is deposited; with thiocarbamide, sulphur is deposited, and sulphuric acid formed; with sulphur, sulphuric acid is formed; with thiophen, phenylthiocarbamide, and egg-albumin, no effect is noticeable.

C. F. B.

Improvement of Küster's Hydrogen Sulphide Apparatus. By GUSTAV FRERICHs (*Arch. Pharm.*, 1901, 239, 118—121).—In Küster's apparatus (*Abstr.*, 1893, ii, 134) the acid drops on to a thick layer of iron sulphide, and is completely used up as it trickles down over it. It has the disadvantage that a good deal of acid enters at first before the steady evolution of gas begins. This is obviated by interposing a small vessel between the large reservoir of acid and the bottle of sulphide; this vessel has a valve that will admit air but permit none to escape; it can also be connected temporarily with the air by means of a rubber tube and pinchcock. It is first filled with acid from the reservoir whilst its connection with the sulphide bottle is closed; the latter connection is then closed whilst that with the sulphide bottle is opened, the delivery tube of the latter being opened at the same time. To render any but a slow stream of gas impossible and so prevent waste, the end of the delivery tube is packed with cotton-wool. The sulphide bottle is provided with a safety tube dipping under mercury.

C. F. B.

Hydrate of Sulphuryl Chloride. By ADOLF BAEYER and VICTOR VILLIGER (*Ber.*, 1901, 34, 736—738).—A crystalline hydrate, $\text{SO}_2\text{Cl}_2 \cdot \text{H}_2\text{O}$, is produced on adding sulphuryl chloride to ice-cold water; the substance resembles camphor in appearance and melts at the ordinary temperature. It is only slightly soluble in cold water, and is but slowly decomposed by this solvent at 0° ; on allowing the temperature of the mixture to rise, the crystals disappear and the original chloride is regenerated, the inverse change taking place when the reagents are cooled. The hydrate is stable even in the presence of sodium hydrogen carbonate, and the formation of the crystals is observed on adding sulphuryl chloride to an ice-cold aqueous solution of this alkali. The stability of the hydrate towards water and the hydrogen carbonate seems to indicate that the elements of water are not added to the acid chloride in such a manner as to form the dihydroxide, $\text{SOCl}_2(\text{OH})_2$, for such a substance has a constitution corresponding with chlorosulphonic acid, $\text{SOCl}(\text{OH})$, a compound instantly decomposed in aqueous solutions.

G. T. M.

Interaction of Potassium Permanganate and Alkali Thio-sulphates in Neutral Solutions. By LEONARD DOBBIN (*J. Soc. Chem. Ind.*, 1901, 20, 212—218).—Earlier work on this subject is discussed

at some length, and new experiments are described from which the following conclusions are drawn. In cold, neutral solutions, the action gives rise to a dark brown, flocculent precipitate and a neutral solution, not an alkaline one, as stated by Spring and Levy (*Bull. Acad. Roy. Belg.*, 1876, [ii], 42, 103). The quantity of potassium permanganate necessary to produce a permanent pink coloration with a known weight of thiosulphate varies slightly with the conditions of temperature and the rate of addition of the solution, and is always less than the amount theoretically necessary to form the sulphate, assuming the permanganate to be reduced only to manganese dioxide. The precipitate formed is a manganite and always contains some manganese in a lower state of oxidation than the dioxide; when thoroughly washed, it contains the alkali metal and manganese in varying proportion depending on the conditions of its formation, along with traces of sulphur compounds, and is able to slowly decolorise dilute solutions of potassium permanganate. The solution filtered from the manganite contains sulphate and tetrathionate in the mol. ratio of about 6:1, this ratio being nearly the same at every stage of the interaction; this fact proves that the sulphate is not formed from the tetrathionate by further oxidation, as assumed by Fordos and Gelis (*Ann. Chim. Phys.*, 1848, [iii], 22, 60) and by Spring and Levy (*loc. cit.*), but that two oxidations occur simultaneously. The solution containing the tetrathionate, when free from thiosulphate, slowly decolorises dilute potassium permanganate, but complete oxidation of the tetrathionate to sulphate does not occur even after prolonged boiling with an excess of the oxidising agent.

In neutral solution, there is no evidence of any other sulphur compound being formed than sulphate and tetrathionate (compare Lückow, *Abstr.*, 1893, ii, 164). W. A. D.

Temperature of Ignition of Phosphorus. By F. H. EYDMANN jun. (*Rec. Trav. Chim.*, 1900, 19, 401—407).—This was measured by gradually raising the temperature, by means of a water-jacket, of melted phosphorus submerged in water, whilst a current of air or oxygen was bubbled through the fused mass; time readings of the temperature of the water above the phosphorus were taken, the ignition point being that at which a rapid increase of temperature was observed. This was found to be at 45.0—45.2° in air, oxygen, or air diluted with an equal volume of carbon dioxide, the temperature of ignition thus being independent of the concentration of the oxygen. W. A. D.

Composition of Amorphous Phosphorus. By FRIEDRICH FIRTICA (*Chem. Zeit.*, 1901, 25, 261. Compare this vol., ii, 236).—If dry, amorphous phosphorus is heated with lead oxide and amorphous boron, a reaction takes place between 140° and 205°; water is evolved and lead sulphate and boron nitride are formed. If boron trioxide is used instead of lead oxide, arsenic also is formed, with or without antimony. The author thinks that amorphous phosphorus is a compound of nitrogen, sulphur, and hydrogen, and that it may have the formula N_2SH_2 ; he remarks, however, that his experiments do not furnish a complete proof of this quantitative composition. C. F. B.

Detection of Nitrogen in Arsenic. Transformation of Arsenic into Antimony. By FRIEDRICH FITTICA (*Chem. Zeit.*, 1901, 25, 259. Compare Abstr., 1900, ii, 476, 651).—A reply to Arnold and Murach (this vol., ii, 236). C. F. B.

Preparation of Arsenic free from Antimony. By N. A. ORLOFF (*Chem. Zeit.*, 1901, 25, 290).—Pure arsenic is obtained free from antimony by precipitating pure crystalline sodium arsenate with magnesia mixture, dissolving the precipitate in hydrochloric acid, and precipitating it fractionally with ammonia; the middle fraction is washed, dried, and sublimed with sugar-charcoal.

The yellowish-red deposit, obtained by Fittica (this vol., ii, 236) in the reaction of arsenic with amorphous boron, was presumably Bettendorf's variety of arsenic, which is formed at a low temperature and is transformed into the ordinary grey variety when heated.

C. F. B.

Action of Hydrogen on Realgar and the Inverse Reaction Influence of Pressure and Temperature. By H. PÉLABON (*Compt. rend.*, 1901, 132, 774—777. Compare Abstr., 1900, ii, 652).—When a mixture of realgar and arsenic is heated with hydrogen (*loc. cit.*), the pressure of the gas has no influence on the limiting composition of the gaseous mixture, but if arsenic is absent, the value of R is affected by the pressure. The lower the pressure the higher the value of R , and the more does it differ from the value obtained in presence of excess of arsenic. If the realgar is not completely volatilised, its mass is without influence on the value of R . In the action of hydrogen sulphide on arsenic, on the other hand, the value of R is lower the lower the pressure of the gas. These results agree qualitatively with the thermodynamic theory of dissociation.

C. H. B.

Action of Sodium Ethoxide and Alkalis on Arsenic Pentasulphide. By RUDOLPH F. WEINLAND and P. LEHMANN (*Zeit. anorg. Chem.*, 1901, 26, 322—344).—When arsenic pentasulphide is dissolved in cold solutions of alkali hydroxides, ammonia, or barium hydroxide, thioarsenate and thiooxyarsenates are formed. The reaction which takes place is expressed by the equation $4\text{As}_2\text{S}_5 + 24\text{KOH} = 3\text{AsS}_2\text{O}_2\text{K}_3 + 2\text{AsSO}_3\text{K}_3 + 3\text{AsS}_4\text{K}_3 + 12\text{H}_2\text{O}$. Dithiooxyarsenates are formed in greater quantity than monothiooxyarsenates, which is not in accordance with McCay's results (this vol., ii, 95). By the action of sodium hydroxide on a mixture of arsenic trisulphide and sulphur, the same salts are obtained, and this is the best method of preparing dithiooxyarsenates.

Sodium hydroxide and arsenic trisulphide yield arsenic, thioarsenate, and mono- and di-thiooxyarsenates. When alcoholic sodium hydroxide is employed, mono- and di-thiooxyarsenates and arsenates are formed.

A solution of arsenic pentasulphide in an alkali hydroxide, when treated with acid, does not give a quantitative precipitate of arsenic pentasulphide; the thiooxyarsenates are only partially decomposed in the cold and on warming are converted into arsenious acid, which remains in the solution.

Thioarsenates are completely decomposed by a solution of potassium antimonyl tartrate in potassium sodium tartrate, and a quantitative precipitate of antimony tetrasulphide, Sb_2S_4 , is obtained. By this reagent it is therefore easy to estimate thioarsenates in the presence of thiooxyarsenates, since the latter salts are not affected.

E. C. R.

Preborates. By SIMEON M. TANATAR (*Zeit. anorg. Chem.*, 1901, 26, 343—346).—By the electrolysis of orthoborates, a solution is obtained at the anode which decolorises permanganate and liberates iodine from potassium iodide, whence the author concludes that a small quantity of perborate is formed, this being contrary to the observations of Constam and Bennett (this vol., ii, 17). It is, however, at present impossible to distinguish between the reactions for hydrogen peroxide and perborates, but since hydrogen peroxide converts borates into perborates, the formation of hydrogen peroxide must necessarily be accompanied by the formation of perborates.

E. C. R.

Perborates. By EMIL J. CONSTAM and J. CORA BENNETT (*Zeit. anorg. Chem.*, 1901, 26, 451).—In answer to Tanatar's criticisms (preceding abstract), the authors claim to be the first to show that perboric acid is monobasic. With regard to the formation of perborates by the electrolysis of borates, they point out that such a dilute solution of hydrogen peroxide as is formed under these conditions is not capable of converting borates into perborates.

E. C. R.

Reducing Action of Carbon on Metallic Compounds. By OCTAVE BOUDOUARD (*Bull. Soc. Chim.*, 1901, [iii], 25, 282—287. Compare Abstr., 1899, ii, 287, 365, 417, 595).—Intimate mixtures of dry, purified carbon with various metallic compounds were heated in porcelain at known temperatures, ranging from 445° to 1150° , and the gases evolved collected and analysed. The substances experimented with were calcium carbonate, barium carbonate, barium sulphate, zinc oxide, nickel oxide, and cupric oxide. The results obtained are in accord with Berthelot's observations on the reduction of alkali sulphates by hydrogen and carbon, and with the author's previous study of the reaction $2\text{CO} \rightleftharpoons \text{CO}_2 + \text{C}$ (Abstr., 1899, ii, 417, 596). The reducing action is not due directly to carbon, probably because of its polymerised state, but to carbon monoxide, a trace of which is always present to start the reaction. The carbon dioxide formed is then decomposed by carbon with the regeneration of carbon monoxide, and so on indefinitely.

N. L.

Cæsium Compounds. By CAMILLE CHABRIÉ (*Compt. rend.*, 1901, 132, 678—681).—Cæsium bromide is obtained in a pure state by mixing together solutions of cæsium sulphate and barium chloride so that the latter salt is in slight excess, evaporating the filtered liquid to dryness, calcining the residue and repeatedly crystallising the product; the smaller and less defined isotropic crystals which first separate correspond with the formula CsBr . Cæsium iodide is obtained in a like manner, the solutions containing the salt being evaporated at 60° under reduced pressure; it separates in well-defined, white, cubical

crystals. *Cæsium hydrogen fluoride*, CsHF_2 , prepared by dissolving pure cæsium carbonate in hydrofluoric acid and allowing the solution to evaporate, first over sulphuric acid and then over quicklime, separates in long, hygroscopic needles and has a distinctly acid reaction. *Cæsium fluoride*, CsF , obtained by calcining the preceding salt in the presence of ammonium fluoride at a temperature short of redness, crystallises in the cubic system. *Cæsium chromate*, Cs_2CrO_4 , crystallises in light yellow needles from the solution obtained by mixing together silver chromate and cæsium chloride dissolved in boiling water; the *di-chromate*, $\text{Cs}_2\text{Cr}_2\text{O}_7$, produced by adding the equivalent amount of chromium trioxide to a solution of the preceding salt, separates in bright red, sparingly soluble crystals. G. T. M.

Action of Hydrogen Peroxide on Silver Oxide. By ADOLF VON BAEYER and VICTOR VILLIGER (*Ber.*, 1901, 34, 749—755).—The authors' experiments confirm Thénard's statement that a mixture of hydrogen peroxide and silver oxide always evolves more oxygen than would be liberated by the action of a catalyst on the peroxide. Practically equal amounts of oxygen are obtained from a given quantity of hydrogen peroxide whether it is treated with metallic silver or spongy platinum; the yield is always somewhat short of the theoretical because the solution retains a portion of the gas in a state of supersaturation.

Hydrogen peroxide evolves more oxygen when treated with silver oxide than with spongy platinum, the excess being produced by the reduction of the silver oxide; the greater portion of the gas is eliminated by shaking the mixture, and subsequent treatment of the solution and precipitate with dilute sulphuric acid fails to set free any more of the gas. This result contradicts Berthelot's hypothesis as to the intermediate formation of the peroxide Ag_4O_3 (compare *Abstr.*, 1880, 441, and this vol., ii, 8).

When hydrogen peroxide is added to silver oxide, the action takes place initially in accordance with the equation $\text{H}_2\text{O}_2 + \text{Ag}_2\text{O} = 2\text{Ag} + \text{O}_2 + \text{H}_2\text{O}$; subsequently a portion of the peroxide is decomposed catalytically by the finely divided silver produced. There is no experimental justification for assuming the existence of the silver peroxide. G. T. M.

Solubility of Lime in Water at Different Temperatures. By A. GUTHRIE (*J. Soc. Chem. Ind.*, 1901, 20, 223—224).—Solubilities are given in grams of lime per 100 c.c. of saturated lime water for every 5° of temperature from 5—100°, and the relationship of these values with those of other observers dealt with. W. A. D.

Reducing Properties of Magnesium and Aluminium. By ANDRÉ DUBOIN (*Compt. rend.*, 1901, 132, 826—828).—Magnesium filings, when moistened with water and primed with a little of the dry metal, take fire and burn with great brilliancy; the flame obtained with a mixture of coarsely powdered aluminium and water, when fired by a priming of magnesium powder, is even more brilliant. A mixture of alumina (1 mol.) and aluminium (4 atoms) when ignited at one point

becomes incandescent throughout, with the formation of the suboxide Al_2O . These reactions take place with equal readiness in an atmosphere of hydrogen, when the mixtures are fired by means of an oxygen flame burning in this gas. The oxides of the alkaline earth metals are, under these conditions, reduced by magnesium or aluminium, the reaction taking place most readily in the case of baryta. A mixture of boric oxide and magnesium, when ignited in hydrogen, yields boron mixed with a certain amount of magnesium boride; a similar reaction occurs when the magnesium is replaced by aluminium; in this case, a priming of magnesium and barium oxide is required. A mixture having the composition $\text{Ca}_3(\text{PO}_4)_2 \cdot 8\text{Mg}$ burns with incandescence, either in air or hydrogen; in the latter gas, a solid yellow hydrogen phosphide is deposited on the sides of the experimental tube; the product of reduction evolves spontaneously inflammable phosphine on treatment with water. The calcium phosphate is not completely reduced when the magnesium is replaced by an equivalent amount of aluminium. A mixture of potassium dichromate (1 mol.) and aluminium ($3\frac{2}{3}$ atoms), when ignited, continues to burn vigorously, with evolution of potassium vapour; this metal, when set free in an atmosphere of hydrogen, absorbs the gas so rapidly that a partial vacuum is produced in the apparatus. G. T. M.

Copper Antimonates. By A. E. DELACROIX (*Bull. Soc. Chim.*, 1901, [iii], 25, 289—290).—The antimonates of copper, and the double antimonate of copper and ammonium, have already been described (Abstr., 1900, ii, 145). A potassium copper antimonate and a basic copper antimonate have now been obtained. N. L.

Preparation of Aluminium Chloride, Bromide, and Iodide. By GABRIEL GUSTAVSON (*J. pr. Chem.*, 1901, [ii], 63, 110—112).—Aluminium chloride and bromide are obtained by gently warming aluminium foil, contained in a hard glass tube, in a current of chlorine or bromine; the product in each case distils over into a receiver. The iodide is very readily prepared by leaving a mixture of equivalent proportions of aluminium foil and iodine, with three times its weight of carbon disulphide, in a stoppered vessel for about 2 days, at the ordinary temperature. The iodide dissolves in the carbon disulphide as soon as it is formed. W. A. B.

Compounds of Aluminium Bromide with Bromine and Carbon Disulphide. By WLADIMIR A. PLOTNIKOFF (*J. Russ. Phys. Chem. Soc.*, 1901, 33, 91—94. Compare Abstr., 1900, i, 323).—By the action of bromine on aluminium bromide in carbon disulphide solution, a compound, $\text{AlBr}_3 \cdot \text{Br}_4 \cdot \text{CS}_2$, is obtained as an extremely hygroscopic, amorphous, yellow powder with a faint greenish tint; it is quickly turned red by sunlight or by a small quantity of moisture. When heated in a sealed capillary tube, it melts at $86-90^\circ$ with evolution of reddish-brown vapours which condense on the upper parts of the tube; if the heating be continued to above 100° , the carbon disulphide and bromine are given off, aluminium bromide being left. The compound is soluble in ether, carbon disulphide, ethyl bromide, ethylene dibrom-

ide, or benzene. By the action of water, it gives rise to Hell and Urech's trithiobromide, $C_2Br_6S_3$ (Abstr., 1882, 706, 945).

T. H. P.

Chemical Action between Dry Hauerite and Various Metals at the Ordinary Temperature. By GIOVANNI STRÜVER (*Atti Real. Accad. Lincei*, 1901, [v], 10, i, 124—127).—When hauerite is left for some time in contact with silver, the latter becomes coated with a black layer of silver sulphide. Preliminary experiments show that a similar action takes place when metals other than silver are used. The investigations are being continued.

T. H. P.

Constituents of Commercial Ferrosilicons. By PAUL LEBEAU (*Compt. rend.*, 1901, 132, 681—683).—The iron silicide produced by heating iron with excess of copper silicide corresponds with the monosilicide, $FeSi$, and the commercial specimens examined did not contain more than 33 per cent. of silicon (compare De Chalmot, Abstr., 1899, ii, 488). The monosilicide is sometimes found in leaf-like masses of crystals situated in the geodes found in the commercial silicides, these substances also containing the compounds Fe_3Si and $FeSi_2$.

The *disilicide*, $FeSi_2$, produced by treating iron and excess of silicon in the electric furnace, is isolated in the form of small, lustrous crystals.

The commercial silicides contain small quantities of carbon, chiefly in the form of graphite, although traces of amorphous carbon are sometimes noticed. There is no evidence, however, that carbon replaces silicon in atomic proportions in these products in the manner indicated by Jouve (compare next abstract). The presence of amorphous carbon is almost invariably associated with that of manganese and the other impurities of the silicides; calcium, sulphur, and phosphorus may also have some influence on the condition of the carbon contained in the silicides.

G. T. M.

Iron Silicides. By ADOLPHE JOUVE (*Bull. Soc. Chim.*, 1901, [iii], 25, 290—293).—Commercial iron silicon alloys contain their silicon in the form of the two silicides, Fe_2Si and $FeSi$, characteristic crystals of which are frequently observed. In many cases, the silicon appears to be partially replaced by carbon. The existence of the silicides, $FeSi_2$, Fe_3Si_2 and Fe_5Si_2 , which have been described by other observers, is considered doubtful.

N. L.

Preparation of Uranium. By JULES ALOY (*Bull. Soc. Chim.*, 1901, [iii], 25, 344—346).—Small quantities of uranium may readily be obtained by heating a mixture of the oxide U_3O_8 with sugar carbon in the electric furnace, using a current of 150 amperes at 50—60 volts; the high current densities employed by Moissan are, therefore, not absolutely necessary. The oxide may also be reduced by heating to redness with magnesium or aluminium, but a better method, admitting of the ready separation of the uranium, consists in heating a mixture of the oxide UO_2 with carbon to dull redness and starting the reduction by adding a cartridge of magnesium and barium dioxide.

N. L.

Studies on Solutions of Tin Salts. I. Electrical Conductivity of Solutions of Stannous Chloride and Hydrochloric Acid. By STEWART W. YOUNG (*J. Amer. Chem. Soc.*, 1901, 23, 21—36. Compare Abstr., 1898, ii, 595).—Stannous chloride and hydrochloric acid form molecular complexes in solution, the formation of such complexes increasing with the concentration. In so far as reduction of electrical conductivity may be taken as a measure of such association, there is evidence of two distinct forms of association, one being considerably more sensitive to dilution than the other, that is, having a larger dissociation constant. Potassium chloride shows a greater power of association at large concentrations than does hydrochloric acid, and it appears that potassium iodide has a still greater influence in the direction of forming complexes in stannous chloride solutions. J. C. P.

Antimonic Acids. By A. E. DELACROIX (*Bull. Soc. Chim.*, 1900, [iii], 25, 288—289. Compare Abstr., 1900, ii, 145).—Antimonic hydroxide is obtained in a pulverulent form by dissolving 1 kilogram of antimony trichloride in a litre of hydrochloric acid, heating the solution to 100°, adding 250 c.c. of nitric acid, cooling, and adding water. It dissolves in warm water to form tetra-antimonic acid; a solution saturated at 70° contains 53.89 grams Sb_2O_5 per litre, and has a sp. gr. 1.0497. The existence of the following antimonates is indicated by neutralising triantimonic acid with alkalis under various conditions: $\text{K}_2\text{O}, 2\text{Sb}_2\text{O}_5$; $4\text{K}_2\text{O}, 5\text{Sb}_2\text{O}_5$; $\text{Li}_2\text{O}, \text{Sb}_2\text{O}_5$; $4\text{BaO}, 5\text{Sb}_2\text{O}_5$; $9\text{BaO}, 10\text{Sb}_2\text{O}_5$; $2\text{BaO}, 3\text{Sb}_2\text{O}_5$. N. L.

Basic Nitrates of Bismuth. By F. B. ALLAN (*Amer. Chem. J.*, 1901, 25, 307—315).—The basic nitrate, $\text{BiO} \cdot \text{NO}_3, \text{H}_2\text{O}$, is readily obtained if nitric acid solutions of bismuth are poured into water at the ordinary temperature and the precipitate quickly removed. Even when the mother liquor is in equilibrium with more basic salts, the same compound is obtained, since, where the strong acid solution meets the water and the precipitate is formed, the concentration of the acid is high, and, even when the crystalline precipitate comes in contact with weaker acid, the action is too slow to produce any appreciable change in the course of a few hours.

At 21°, the salt $\text{Bi}_{12}\text{O}_{13}(\text{NO}_3)_{10}, 9\text{H}_2\text{O}$ is in equilibrium with nitric acid solution from 0.03 to 0.32 *N*, and the salt $\text{BiO} \cdot \text{NO}_3, \text{H}_2\text{O}$ with solutions from 0.425 to 0.72 *N*.

At 50°, the salt $\text{Bi}_4\text{O}_5(\text{NO}_3)_2, \text{H}_2\text{O}$ is in equilibrium with nitric acid solutions from 0.057 to 0.285 *N*, and the salt $\text{Bi}_{12}\text{O}_{13}(\text{NO}_2)_{10}, 9\text{H}_2\text{O}$ with solutions from 0.285 to 0.466 *N*.

At 75°, the salt $\text{Bi}_4\text{O}_5(\text{NO}_3)_2, \text{H}_2\text{O}$ is in equilibrium with solutions from 0.109 to 0.314 *N*.

No basic nitrate containing a greater proportion of nitric anhydride than the salt $\text{Bi}_4\text{O}_5(\text{NO}_3)_2, \text{H}_2\text{O}$, and less than $\text{Bi}_{12}\text{O}_{13}(\text{NO}_3)_{10}, 9\text{H}_2\text{O}$, exists at 50°, although at least two have been previously described.

J. J. S.

Presence of Platinum amongst the Characters of a Hieroglyphic Inscription. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1901, 132, 729—732).—One of the hieroglyphs on an Egyptian box,

found at Thebes and dating from the seventh century B.C., was found to consist mainly of platinum, which, however, from its resistance to the action of acids, was probably alloyed with iridium. C. H. B.

Mineralogical Chemistry.

Theories of the Origin of Petroleum. By CONSTANTIN KLEMENT (*Bull. Soc. Belge Geol.*, 1901 (for 1897), 11, *Proc.-Verb.*, 76—85).—A résumé is given of the various theories which have been proposed.

L. J. S.

Discovery and Occurrence of Minerals containing Rare Elements. By ADOLF ERIK NORDENSKIÖLD (*Quart. J. Geol. Soc.*, 1900; 56, 521—530).—A historical survey is given of the discovery and occurrence, especially in Scandinavia, of minerals (cerite, thorite, fergusonite, &c.) containing rare elements, and in which the new gases, helium, &c., have been found.

L. J. S.

Metalliferous Deposits of Canton Grisons. By CHR. TARNUZZER, GUSTAV NUSSBERGER, and P. LORENZ (*Jahresber. Naturf. Ges. Graubündens*, 1900, 43, 1—47).—Several analyses are given of ores, especially ores of iron.

L. J. S.

Chalcopyrite. By LEONARD P. MORGAN and EDGAR F. SMITH (*J. Amer. Chem. Soc.*, 1901, 23, 107—109).—Chalcopyrite contains the whole of its iron in the ferrous state.

E. G.

Separation of Titaniferous Iron Ores in Basic Igneous Rocks. By JOHAN H. L. VOGT (*Chem. Centr.*, 1901, i, 473, 536; from *Zeit. Prakt. Geol.*, 1900, 370—382; 1901, 9—19).—The discussion of this problem is continued (this vol., ii, 63). Analyses have been made to determine which elements are concentrated with the titanium and which are not. Details are given of the method employed for the estimation of titanium.

L. J. S.

Canadian Minerals. By G. CHRISTIAN HOFFMANN (*Zeit. Kryst. Min.*, 1901, 34, 209—210; from *Ann. Rept. Geol. Survey Canada*, for 1898, 1900, 11, Part R).—The following mineral analyses by R. A. A. Johnston are given. Celestite: milk-white, translucent, radiated material forming a vein at Bagot, Renfrew Co., Ontario, gave the following results, corresponding with SrSO_4 , 85.63; BaSO_4 , 14.38 per cent.:

SO_3 .	SrO .	BaO .	CaO .	Total.	Sp. gr.
42.09	48.30	9.44	trace	99.83	3.994

Hübnerite: brownish-black material with submetallic lustre, con-

choidal fracture, and a lamellar structure, occurs in quartz, associated with copper pyrites, and yellow hydrated mica, at Emerald, Inverness Co., Nova Scotia.

WO ₃ .	MoO ₃ .	MnO.	FeO.	CaO.	MgO.	SiO ₂ .	Total.	Sp. gr.
74.28	trace	22.73	0.47	0.02	0.86	1.33	99.69	6.975

Hydromagnesite: a large deposit of this occurs near "108, Mile House," on the Cariboo Road, British Columbia. Analysis of pure white material gave:

CO ₂ .	MgO.	CaO.	Al ₂ O ₃ .	Fe ₂ O ₃ .	P ₂ O ₅ .	SiO ₂ .
37.03	43.71	0.10	0.02	0.04	0.30	0.38
H ₂ O and some organic matter.			Insol.	Total.		
17.79			1.53	100.90		

Natron: large quantities of this occur on the bed of the Goodenough lake, Lilloet district, British Columbia. Analysis of a transparent fragment gave the following results. On ignition the material loses 0.29 per cent. of carbon dioxide:

Na ₂ O.	CO ₂ .	H ₂ O.	NH ₃ .	SO ₃ .	P ₂ O ₅ .	B ₂ O ₃ .
21.36	15.46	63.03	little	0.08	0.01	trace
		Cl.	SiO ₂ .	Total.		
		0.01	0.01	99.96		

Other mineral occurrences are mentioned.

L. J. S.

Glaucescence of Felspars. By CARLO VIOLA (*Zeit. Kryst. Min.*, 1901, 34, 171—195).—The name glaucescence is applied to the blue schiller shown by certain felspars, as distinct from the multicoloured schiller shown by labradorite (labradorescence). The phenomenon is described and discussed in detail. One of the felspars examined is moonstone from Ceylon, of which the following analysis by E. H. Kraus is given:

SiO ₂ .	Al ₂ O ₃ .	CaO.	K ₂ O.	Na ₂ O.	Ignition.	Total.
65.87	19.45	0.51	11.91	2.57	0.18	100.49

L. J. S.

Labradorite and Topaz from N.S.Wales: Estimation of Fluorine. By GEORGE HARKER (*Zeit. Kryst. Min.*, 1901, 34, 215; from *J. and Proc. Roy. Soc. New South Wales*, 1899, 33, 193—203; and *Chem. News*, 1900, 82, 56—57, 64—66).—Analyses I and II are of fragments of labradorite from a basalt at Sandilands Mountain, New England. The material is colourless to brown; sp. gr. 2.70:

	SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	CaO.	Na ₂ O.	K ₂ O.	MgO.	H ₂ O.	Total.
I.	55.05	30.15	10.32	5.11	nil.	nil.	undet.		100.63
II.	54.81	29.70	0.42	9.61	undet.	0.29	0.28	0.13	—

Analyses III and IV are of transparent, rolled fragments of topaz from Mudgee; V and VI of green topaz from New England; VII and VIII of topaz from Brazil.

	SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	F.	H ₂ O (ignition).	H ₂ O (with PbO).	Total.
III.	31.90	56.62	—	17.90	0.23	0.75	107.40
IV.	31.84	56.80	—	17.00	0.26	0.75	106.65
V.	31.73	55.62	0.12	16.30	0.37	1.07	105.21
VI.	31.92	55.43	—	15.92	0.39	1.07	104.73
VII.	31.95	54.52	—	14.62	0.23	2.12	103.44
VIII.	32.16	54.61	—	14.23	0.30	2.12	103.42

The author has tested the several methods for the estimation of fluorine, and obtained exact results only with that of Berzelius. When alumina is present the mineral is mixed with half its weight of silica before being fused with alkali carbonates, otherwise the results obtained for fluorine are too low, whilst those for silica and alumina are too high.

L. J. S.

[Mineral Analyses.] By M. KIŠPATIĆ (*Wiss. Mitth. Bosnien u. d. Herzegovina*, 1900, 7, 377—484).—The following mineral analyses are given in a petrographical paper on the crystalline rocks of the serpentine zone of Bosnia. I, Diopside from the chromite mine in the Iherzolite at Milakovac, Borja planina. II, Diopside, which forms with bronzite a rock in the Iherzolite at Pobilje. III, Bronzite from the same rock as the last. IV, Actinolite schist, composed only of actinolite, from near Kopalište. V, Meerschaum from the magnesite mines in the serpentine at Reljevac. Five analyses are also given of serpentine:

	SiO ₂ .	Al ₂ O ₃ .	Cr ₂ O ₃ .	FeO.	CaO.	MgO.	Ign.	Total.
I.	50.84	0.43	trace	7.18	21.49	16.54	4.23	100.71
II.	50.62	3.98	trace	7.20	19.39	15.76	3.20	100.15
III.	56.00	0.72	—	8.98	0.59	32.44	1.77	100.50
IV.	44.56	6.00	—	9.89	21.34	13.30	4.65	99.74
V.	61.09	—	Fe ₂ O ₃ 2.59	—	—	25.87	10.47	100.02

L. J. S.

Limestones of New York and their Economic Value. By HEINRICH RIES (51st *Ann. Rept. N.Y. State Museum*, for 1897, 1899, ii, 355—467).—An account is given of the geological and geographical distribution of limestones in the State of New York, with details of the economic uses. Several analyses are given.

L. J. S.

A Diluvial Boulder of Nephrite in a Street Pavement at Breslau. By GEORG GÜRICH (*Centr. Min.*, 1901, 71—73).—A boulder of green stone in a street pavement at Breslau was shown by the microscopical examination of thin sections and the following analysis to consist of nephrite. It was, no doubt, brought to its present locality by the northern ice-sheet:

SiO ₂ .	Al ₂ O ₃ .	FeO.	MgO.	CaO.	H ₂ O.	Sp. gr.
56.9	1.4	5.3	17.6	15.9	3.2	2.96

L. J. S.

Uralitised Diallage from the Ardennes. By CONSTANTIN KLEMENT (*Bull. Soc. Belge Geol.*, 1901 (for 1897), 11, *Proc. Verb.*, 150—155).—The crystals in a rock from Recogne, which was described

in 1883 as a chiastolite rock, are now found, on a detailed examination, to be diallage altered to uralite. The excess of silica shown in the following analysis is due to inclusions of quartz in the crystals :

SiO .	Al ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	MnO.	CaO.
62.26	8.89	2.55	5.37	traces	11.23
	MgO.	Na ₂ O.	H ₂ O.	Total.	
	7.51	0.20	3.65	101.66	

L. J. S.

Rocks from the Volcano of Etinde, Cameroons. By E. ESCH (*Sitz.-Ber. Akad. Wiss. Berlin*, 1901, 277—299 ; 400—417).—A petrographical description, with chemical analyses, is given of leucite, nepheline, and hainyene rocks from the volcano of Etinde. L. J. S.

Meteorite from Ceylon. By STANISLAS MEUNIER (*Compt. rend.*, 1901, 132, 501—503).—A description is given of a stone which fell near Mulletiwa in the province of Carnawelpattu, Ceylon, on April 13th, 1795. The structure is chondritic and of the montresite type. Sp. gr., 3.677. Analysis gave: nickel-iron, 17.25 ; silicates (mainly olivine) decomposed by hydrochloric acid, 41.22 ; undecomposed silicate (enstatite), 32.27 per cent. ; troilite, chromite, &c., are also present. The nickel-iron contains 8 per cent. of nickel. L. J. S.

The Red Rain at Palermo in March, 1901. By STANISLAS MEUNIER (*Compt. rend.*, 1901, 132, 894—896).—The author has examined a specimen, collected at Palermo, of the red rain which fell in Tunis, Sicily, and the neighbourhood of Naples on the night of March 9—10, 1901. It is a very fine pale red powder, which is harsh to the touch, scratches glass readily, and is highly charged with air, which it retains very tenaciously. It contains: water, 5.20 ; organic matter, 3.17 ; sand, 59.14 ; calcium carbonate, 23.91 ; clay, 8.58 = 100.00, but small quantities of chlorides, sulphates, and magnesium are also present. The sand consists mainly of angular fragments of quartz, and the substance contains a relatively high proportion of the skeletons of diatoms. The red rain is of the same general character as that observed on previous occasions, and there seems little doubt that it has been removed from the soil of the Sahara by violent atmospheric disturbances.

C. H. B.

Thermal Water from Vals, Lugnez Valley. By GUSTAV NUSSBERGER (*Jahresber. Naturf. Ges. Graubündens*, 1900, 43, 67—68).—Analyses are given of the water which issues from the upper and from the lower part of the bore. The water is ferruginous and contains much gypsum. Temperature 25.2°. L. J. S.

Mineral Springs of Val Sinestra, Lower Engadine. By GUSTAV NUSSBERGER (*Jahresber. Naturf. Ges. Graubündens*, 1900, 43, 69—103).—Detailed analyses are given of waters from three springs, and earlier analyses are quoted for comparison. L. J. S.

Origin of Hot Sulphuretted Waters: Thiosilicates and Oxy-sulphides derived from Natural Silicates. By ARMAND GAUTIER (*Compt. rend.*, 1901, 132, 740—746).—When powdered granite is

treated with cold water, it yields about 1 gram per kilogram of sodium silicate and calcium sulphate, together with smaller quantities of other salts, but the solution contains no sulphides. If, however, the granite is heated with its own weight of water at 250—300° in sealed tubes free from air, a sulphuretted water is obtained identical in composition with many natural hot sulphuretted waters, but containing a larger quantity of alkali hydrosulphides. Like the natural waters, the solution thus obtained contains only minute quantities of potassium salts. All igneous rocks behave in the same way. Ferrous sulphide is not decomposed by water at 260—280° and the hydrogen sulphide is most probably produced by the action of the water on thiosilicates and oxysulphides, which, as the author has previously shown (*Abstr.*, 1889, 212), are formed when reducing gases, such as are liberated when igneous rocks are heated (this vol., ii, 171) act, together with hydrogen sulphide or sulphur, on feldspars, kaolin, alumina, &c. Direct experiment shows that if albite is heated to bright redness in the gases liberated from granite at a high temperature, and is afterwards heated in water at 250°, it yields a sulphuretted and slightly alkaline solution, although no similar results are obtained with albite in its natural condition. Further, thiosilicates, when heated in chlorine, lose part of their sulphur in the form of chloride, and the author finds that when igneous rocks are heated in the gas, small quantities of sulphur chloride are obtained. The presence of the thiosilicates and oxysulphides in igneous rocks is therefore highly probable.

C. H. B.

Physiological Chemistry.

Influence of Certain Materials on the Quantity and Quality of Gastric Juice. By ALEX. HERZEN (*Pflüger's Archiv*, 1901, 84, 101—114).—After a summary of Pawlow's recent work ("Die Arbeit d. Verdauungsdrüsen," 1898), and Schiff's well-known older researches on peptogens, a number of experiments are described performed on dogs, which show that the amount and activity of gastric juice secreted do not necessarily vary together. Some materials (for example, dextrin) given as food are mainly peptogenic, whereas other substances (such as Liebig's extract) increase the flow of juice (safttreibend) without increasing markedly the amount of pepsin.

W. D. H.

Action of "Saccharin" on Gastric Digestion. By ALLYRE CHASSEVANT (*Compt. rend. Soc. Biol.*, 1901, 53, 206—207).—The addition of "saccharin" (benzoic sulphinide) to artificial gastric juice hinders its proteolytic activity, as tested by Mette's tubes. The following are the figures given:

					Digestive power.
Gastric juice, control experiment					100
"	addition of 0.04 "saccharin" per cent...				58
"	"	0.2	"	"	29
"	"	0.4	"	"	7

W. D. H.

Ferment acting on Salol in Various Organs. By P. NOBÉCOURT and PROSPER MERKLIN (*Compt. rend. Soc. Biol.*, 1901, **53**, 148—149).—The presence of a ferment which converts salol into salicylic acid is not peculiar to the pancreatic juice, but is found also in bile, the gastric and intestinal mucous membranes, the liver, spleen, suprarenal, kidney, lung, muscle, brain, blood-serum, human milk, the milk of the dog, but not of the cow, ass, or goat. The amount of activity varies considerably in the different cases. It is favoured by an alkaline, and inhibited by an acid, medium. It is possibly identical with lipase. W. D. H.

The Rôle of the Spleen in Trypsin Formation. By ALEX. HERZEN (*Pflüger's Archiv*, 1901, **84**, 115—129).—Schiff held strongly, on what appeared to him sufficient experimental evidence, that the spleen plays an important part in the formation of pancreatic juice, especially in so far as trypsin is concerned. The present author, with whom Schiff worked, has frequently laid these views before physiologists. The present paper is mainly a repetition of previous statements on the subject. The main idea is that the spleen forms an internal secretion, which contains an unknown substance having the property of converting protrypsin into trypsin. W. D. H.

Properties of Pancreatic Juice in Starving Animals. By ÉMILE WERTHEIMER (*Compt. rend. Soc. Biol.*, 1901, **53**, 139—141).—In a fasting animal, a flow of pancreatic juice can be excited by stimulation of the intestinal (especially the duodenal) canal. This juice acts rapidly on starch, but not on proteids. Pilocarpine, however, causes the formation of a juice which acts vigorously also on proteids. W. D. H.

Properties of Pancreatic Juice in Starving Animals. By LUCIEN CAMUS and EUGÈNE GLEY (*Compt. rend. Soc. Biol.*, 1901, **53**, 194—196).—The flow of pancreatic juice produced by duodenal irritation is more abundant, and contains less solid than that poured out after a dose of pilocarpine. After pilocarpine, even in a starving animal, the juice is strongly proteolytic and lipolytic. This confirms Wertheimer's experiments (see preceding abstract) and is strongly opposed to the Schiff-Herzen theory, which presupposes splenic activity to be necessary for the formation of trypsin. W. D. H.

Mechanism of Lipolytic Reactions. By MAURICE HANRIOT (*Compt. rend.*, 1901, **132**, 842—845. Compare this vol., ii, 175).—The hydrolysis of glyceryl esters by lipase, is most readily explained by supposing that this ferment is a weak base, which combines with the fatty acid to form a readily dissociated salt. The oxides of ferric iron and aluminium possess similar properties, forming unstable salts with the organic acids; they also promote the hydrolysis of glyceryl esters, but to an extent far less than that noticed when lipase is employed. Lipase may itself be an iron salt, serum always containing a small quantity of this element; the hydrolytic action is diminished by reducing the iron compound with zinc. On the other hand, the addition of a ferric salt to serum freed from lipase does not restore

the hydrolytic property of the solution. Hematogen, the ferruginous pigment of the egg, has strongly marked lipolytic properties.

G. T. M.

Amylolytic Ferment of the Liver. By PERMILLEUX (*Compt. rend. Soc. Biol.*, 1901, 53, 32—34). **Chloroformic Dialysis and Endo-cellular Ferments.** By A. DASTRE (*ibid.*, 34—35).—If a liver free from blood is exposed in a vacuum to chloroform vapour, a liquid is exuded which contains an amylolytic ferment. This ferment belongs to the class of *endo-cellular* enzymes, and by this term is distinguished from the amylolytic ferment produced by the pancreas which is *exo-cellular*. Some endo-cellular enzymes require severe measures to separate them from the cells, as in Buchner's work with yeast. In other cases, as the present, a comparatively simple method termed 'chloroformic dialysis' is sufficient for the purpose.

W. D. H.

Nuclein Metabolism. By OTTO LOEWI (*Chem. Centr.*, 1901, i, 585; from *Arch. exp. Path. Pharm.*, 45, 157. Compare Abstr., 1900, ii, 417).—From experiments on the author's person, it is found that the nuclein in the food is in part decomposed in the intestine; the phosphoric acid leaves the body in the fæces, and the nitrogenous part is absorbed. The main portion of the nuclein (except when pancreas nuclein is taken) is absorbed, the phosphoric acid remaining in organic union. Feeding on nuclein does not lessen the amount of urea excreted; the fall in urea noticed after feeding on thymus is due to the richness of that organ in extractives. The use of guanine in the form of nuclein increases the uric acid output considerably. Certain points in the work of Burian and Schur are criticised.

W. D. H.

Hæmolysis produced by Solanine. By E. HÉDON (*Compt. rend. Soc. Biol.*, 1901, 53, 227—229).—Acids prevent the destruction of blood corpuscles produced by salts of solanine. Bashford (*Arch. internat. pharmacodyn. et de thérapie*, 1901, 8, 101) considers this is due to acids preventing or lessening the liberation of solanine by dissociation of its salts. The present paper discusses the question raised.

W. D. H.

Estimation of Fat in Blood, and the Amount of Fat in Human Blood. By M. BÖNNINGER (*Chem. Centr.*, 1901, i, 583—584; from *Zeit. klin. Med.*, 42, 65—71).—Some of the discordant results of fat analysis in blood are due to method, and some to the fact that lipolysis occurs. Hoppe-Seyler's method of alcohol extraction gives good results for clinical purposes. In human blood, the percentage of fat is fairly constant (0.75—0.85). In nephritis and diabetes, it rises; in a case of cancer of the œsophagus it rose to 1.4. In ethereal extracts, cholesterol esters are found in addition to neutral fats and lecithin.

W. D. H.

A Method of Distinguishing Varieties of Blood. By UHLENHUTH (*Chem. Centr.*, 1901, i, 584; from *Deutsch. med. Woch.*, 27, No. 6).—The important forensic question of distinguishing human blood from the blood of other animals is the main point of the investigation. Eighteen different kinds of animals were used, and the follow-

ing general rule discovered. If a rabbit receives a weekly intraperitoneal injection of 10 c.c. of the defibrinated blood from an animal of another species, at the end of a month the blood serum of that rabbit is rendered cloudy by the addition of a little blood diluted with water (1 : 100) of that animal. Thus, if a rabbit is treated with human blood, the rabbit's serum is rendered cloudy by the addition of human blood, but not by the blood of any other animal. W. D. H.

Electromotive Phenomena of Resting Frog's Muscle. By MAX OKER-BLOM (*Pflüger's Archiv*, 1901, 84, 191—259. Compare Abstr., 1900, ii, 290, 356, 607).—A continuation of the author's researches on the physico-chemical properties of animal tissues and fluids. A curarised sartorius of the frog, which is electrically streamless, was taken as the subject of the experiments. The addition of water produces negativity, followed later by positivity. Extremely dilute solutions of potassium chloride produce the same effect, but more rapidly. If the concentration of the salt is increased, the second phase disappears. These facts are all stated to be easily explicable on physical grounds such as ionic action between the contractile substance of the muscular fibres and the membranes that enclose them. W. D. H.

Glycogen in Animal Organs. By G. MEILLÈRE and LÉPER (*Compt. rend. Soc. Biol.*, 1901, 53, 153—155).—The amount of glycogen was estimated in a number of organs, and the chemical analyses compared with the histological appearances; the histological method employed was fixation with alcohol and coloration with iodised gum (Ehrlich-Brault). The following figures may be quoted; they give the amount of glycogen in parts per 1000 of the organ or tissue mentioned: rabbit's liver, 8; rat's liver, 15; muscles of horse, 4 to 5; heart muscle, 2.5. The glycogen of heart muscle is not stable, and rapidly disappears. No glycogen was found in pancreas, spleen, lung, ovary, testis, &c. White blood corpuscles contain variable traces. W. D. H.

Elimination of Cacodylic Acid from the Organism. By LÉONCE BARTHE and R. PÉRY (*J. Pharm.*, 1901, [vi], 13, 209—214).—See this vol., ii, 364.

Iron of Normal Urine. By FRANCESCO NICOLA (*Chem. Centr.*, 1901, i, 584—585; from *Estr. Giorn. Accad. Med. Torino*, 6).—Iron in the urine was estimated by the methods of Hamburger (*Zeit. physiol. Chem.*, 2, 195; 4, 249) and of Lapique (Abstr., 1895, ii, 407). The amount *per diem* is fairly constant in human urine. It averages 0.00075 gram per 1000. The deeper coloured urine of the night contains more than that of the morning or afternoon; there is, however, no necessary correspondence between iron and urinary pigment. W. D. H.

Estimation of Iron in Normal and Pathological Human Urine. By PAUL HOFFMANN (*Zeit. anal. Chem.*, 1901, 40, 73—82).—The author has made nine estimations of iron in normal urine, with results ranging from 0.49 to 1.7 milligrams (average 1.09) in

the day's excretion. The method of preparing the urine for the estimation was varied, some specimens being incinerated as described by Jolles (Abstr., 1897, ii, 286), whilst in others the organic matter was destroyed by boiling down with nitric acid and heating with ammonium nitrate and sulphuric acid (Abstr., 1899, ii, 814). The latter method is the more convenient, and preliminary experiments showed that both methods gave the same result. In no case was less than 500 c.c. of urine employed. The iron was always precipitated with ammonium sulphide, the ferrous sulphide redissolved by fusion with potassium anhydrosulphate, the solution reduced by zinc in an atmosphere of carbon dioxide, and titrated with permanganate, correcting for the iron in the zinc. The much higher results obtained by Jolles seem incapable of explanation, but the still higher ones of Müller and Hamburger were probably due to experimental errors. The average in three cases of leucæmia was 1.37 mg. (1.03—1.09), whilst six specimens of diabetic urine gave results ranging from 1.83 to 5.88 mg., and a single case gave 22.02 mg. The urine of a phthisical subject, amounting to only 230 c.c. in 2 days, contained only 0.47 mg. per day.

M. J. S.

Respiratory Exchange in Tuberculosis. By ALBERT ROBIN and MAURICE BINET (*Compt. rend.*, 1901, 132, 709—711).—Although the amount of air breathed is less in a phthisical person than in a healthy one, the respiratory exchange is more active. The same is true in cases of tuberculosis of the testis, pleura, and lymph glands, but not in that of tubercular peritonitis, meningitis, and lupus. Examination of the respiratory metabolism is believed to be of diagnostic value in cases of doubtful phthisis. Increase of respiratory activity is stated also to occur in descendants of phthisical parents, before the invasion of the bacillus, and the condition is believed to be favourable to the growth of the bacillus.

W. D. H.

Toxic Action of Electrolytes on Fishes. By LOUIS KAHLENBERG and HUGO F. MEHL (*J. Physical Chem.*, 1901, 5, 113—132).—The species of fish used were yellow perch, rock-bass, dace, and brook-trout. These were immersed in various dilute solutions of electrolytes and the time noted until the fish lost control of its motion and turned over on its back. The vitality of the fishes is in the order given.

The experiments with acids and alkalis indicate that the dissociation theory is not capable of explaining the action of the various solutions. Thus, hydrochloric and nitric acids in solution of greater dilution than $N/100$ have apparently the same toxic action, but sulphuric acid solutions of equivalent normality are somewhat less virulent, although complete dissociation may be assumed for so dilute solutions. $N/50$ acetic acid is appreciably more virulent than $N/1000$ hydrochloric acid, although it contains fewer hydrogen ions. The toxicity of potassium hydroxide solution changes so slightly with dilution that the action is probably not due to hydroxyl ions.

Silver nitrate and sulphate at equivalent dilution have almost the same action; these are extremely poisonous, more so even than potassium cyanide or mercuric chloride. Other salts have also been examined.

The length, weight, and *post moriem* examination of the fishes are given. J. McC.

Pharmacological Researches on some Cyanopyridone Derivatives. By A. DERIU (*Chem. Centr.*, 1901, i, 582; from *Giorn. Real. Accad. di Medicina Torino*, 1900, 6).—The author has investigated the action on dogs, rabbits, and cats of the following compounds: 3-cyano-2-oxy-4:6-dimethylpyridine; 3-cyano-2-oxy-4:5:6-trimethylpyridine; 3-cyano-2-oxy-1:4:6-trimethylpyridine; 3-cyano-2-oxy-1:4:5:6-tetramethylpyridine; and 3-cyano-2-oxy-1:4:6-trimethylpyridine. All these substances produce a rapid action on the nervous system, causing intense convulsions and marked epileptic attacks together with increased flow of saliva and myosis; their poisonous action is, however, slight (compare Sabbatani, 1900, ii, 94). Conclusions are drawn with regard to the influence of an increase of molecular weight and of the number of methyl groups in the molecule on the intensity of the poisonous action. T. H. P.

Chemistry of Vegetable Physiology and Agriculture.

Production of Acetylmethylcarbinol by *Bacillus Tartricus*. By LÉON GRIMBERT (*Compt. rend.*, 1901, 1, 706—708).—A 5 per cent. solution of dextrose or sucrose containing traces of peptone and calcium carbonate is treated for 15 days with a pure culture of *Bacillus tartricus* at 37° and then filtered and distilled; the distillate contains a compound reducing Fehling's solution even in the cold which is identified as acetylmethylcarbinol by its osazone and osotetrazone (von Pechmann, Abstr., 1888, 1287). These sugars yield about 4 per cent. of this compound, whilst lactose and mannitol furnish smaller quantities; dextrin, glycerol, and calcium tartrate do not, under these conditions, give rise to any osazone. Negative results were obtained on substituting *B. coli*, Eberth's bacillus, and Friedländer's pneumobaccillus for *B. tartricus* in the preceding experiment. G. T. M.

Influence of Phosphates on the Fermentative Action of Yeast Extract; Complex Phosphoric Acids and the Rôle of Phosphoric Acid in Animated Nature. By AUGUSTIN WRÓBLEWSKI (*Bull. Acad. Sci. Cracow*, 1900, 407—428. Compare Abstr., 1900, ii, 157).—The experiments were carried out as in the previous research (*loc. cit.*), using the extract from a pure culture of yeast. It is found that addition of 1 per cent. of sodium chloride, magnesium sulphate, or potassium nitrate reduces the fermentation, and 2½ per cent. entirely arrests it, whilst even 0.3 per cent. of sodium sulphate is sufficient to unfavourably affect the amount of fermentation. Dibasic phosphates (Na_2HPO_4) and monobasic phosphates (NaH_2PO_4) increase by three or four times the fermenting power of the extract. The former has an optimum effect at a concentration of 1.25, the latter at a concentration of 1 per cent. A mixture of these phosphates has

still a greater augmentative action. Four per cent. of phosphates produces a precipitate and stops fermentation. Acids and alkalis both arrest fermentation when they are present in sufficient quantity to produce a precipitate. Acids precipitate proteids, alkalis the phosphates always present in the extract. Addition of phosphates renders necessary a markedly greater quantity of sodium hydroxide either to reduce or arrest fermentation. Thus in the natural extract 0.1 per cent. of sodium hydroxide brings about a reduction, and 0.2 per cent. the arrest of fermentation; in the presence of phosphates, 0.5 per cent. of the alkali only intensifies the action of the extract, whilst 1 per cent. is required to stop it. Similarly, 0.3 per cent. of hydrochloric acid increases the fermentation, when phosphates have been added, a quantity which would completely destroy the activity of the natural extract.

The author believes that the function of phosphates in the yeast extract and in the yeast plant itself is to maintain the "double reaction" and preserve the active protoplasm of the cell from the injurious action of alkalis or acids, which may develop in the various chemical processes taking place in the living organism.

In the remainder of the paper the author discusses other functions of phosphoric acid in organisms, and draws attention to its capability of forming soluble compounds with various complex organic substances. There is evidence for the existence of such compounds in many liquids of organic origin, as yeast extract, whey, muscle extract, &c.

K. J. P. O.

Reduction of Nitrates in Presence of Farmyard Manure. By J. P. STREET (*Exper. Stat. Record*, 1900, 12, 321—322; from *New Jersey Stat. Rep.*, 1899, 86—96).—Fresh cow dung (about 30 grams) with (1) sodium nitrate, 1.25 gram; (2) ammonium sulphate, 1 gram; (3) dried blood, 1.5 gram, with or without gypsum, acid phosphate, kainite, sulphur (each 0.2 gram), and carbon disulphide (20 c.c.) was diluted to 300 c.c. with water, and kept in open flasks for a month at about 20°. The flasks were occasionally shaken. In one set of experiments, nitric nitrogen was determined at intervals of 7, 14, and 24 days, the second set being kept undisturbed the whole time.

In the mixture of dung and sodium nitrate, denitrification was complete in 24 days; the same mixture, with addition of gypsum, acid phosphate, kainite, and sulphur required 27, 27, 16, and 23 days respectively for complete denitrification. In presence of carbon disulphide, the mixture lost only 9.6 per cent. of its nitrate in 24 days.

In the mixture containing ammonium sulphate, the greatest loss amounted to 4.1 per cent. (with acid phosphate); with kainite and gypsum, there were slight gains.

In the second set of experiments, similar results were obtained with sodium nitrate. In the case of ammonium sulphate, there was always a considerable gain in soluble organic nitrogen (especially under the influence of sulphur and carbon disulphide); the amount of insoluble inorganic nitrogen also increased, most with sulphate, and least with carbon disulphide.

Free ammonia was formed in considerable quantity, especially in the ammonium sulphate and kainite experiments. In the case of dried blood, all the nitrate and combined ammonia were lost.

Kainite seems to have a strong influence in liberating ammonia, whilst carbon disulphide has a retarding effect. N. H. J. M.

Chemical Changes in the Germination of Seeds of *Vicia Faba*. By I. SHULOFF (*Exper. Stat. Record*, 1900, 11, 749; from *Izv. Moscow Selsk. Khoz. Inst.*, 1899, 5, 192—202).—The results of experiments with seedlings, 10 days old, showed that whilst the distribution of asparagine is fairly uniform, the other amino-compounds occur to a much greater extent in the cotyledons than in the stalks. With regard to peas, Lokot found that there was no concentration of asparagine in any particular part of the plant, and that the concentration of the other amides varied greatly. N. H. J. M.

Germination of Seeds as affected by certain Chemical Manures. By G. H. HICKS (*Exper. Stat. Record*, 1900, 12, 347—348; from *U.S. Dept. Agr. Div. Bot. Bul.*, 24, 15).—Experiments were made on the effect of sodium nitrate, potassium chloride, bone black, oyster shell lime, and a mixed manure (bone black, potassium chloride, and sodium nitrate) on the germination of wheat, lettuce, radish, and crimson clover. In many, if not in most, cases, the manures acted injuriously on the sprout after it had passed through the seed coats.

Potassium chloride and sodium nitrate are very detrimental in strengths of 1 per cent. Phosphoric acid and lime manures are much less injurious, and may be harmless if not employed in excess.

Commercial manures should not be brought into direct contact with germinating seeds.

The effect of chemicals on seeds before planting is no index of the effect produced by the same chemicals in the soil. Injury by chemical manures is due to their action on the young sprouts; the seeds themselves are only slightly injured, or are not injured at all.

It is very improbable that germination is benefited by the nitrogen, potassium, calcium, and phosphoric acid applied as manures.

N. H. J. M.

Influence of Distance on the Growth and Composition of Plants. By CONRAD VON SEELHORST and PANAOTOVIC (*Exper. Stat. Record*, 1900, 12, 132; from *J. Landw.*, 1899, 47, 379—389).—Oats and spring wheat were grown in pots containing one, five, and eight plants. Of the different constituents, nitrogen was the most influenced. Taking the amount of nitrogen in oats, 1 plant per pot, as 100, the amounts were 80.5 and 70.1 per cent. when five and eight plants respectively were grown in one pot. The alteration in the total ash and ash constituents, although very marked, was not so great.

The nutritive value of the plants grown five and eight in a pot was only 85.42 and 76.91 per cent. as much as that of plants grown one in a pot. In accordance with what is usually observed, the relation of straw to grain increased as the distance between the plants was decreased.

N. H. J. M.

Composition of Rye Grain at Different Stages of Ripeness. By N. K. NEDOKUCHAEFF (*Exper. Stat. Record*, 1900, 11, 636; from *Izv. Moscow Selsk. Khoz. Inst.*, 1899, 5, 212—224).—Rye grain, which was analysed at intervals of five days, beginning with the end of the period of flowering and ending with yellow ripeness, was found to accumulate carbohydrates, the soluble forms being rendered insoluble. There was also an increase of proteids and a decrease of other nitrogenous compounds. The relative amount of nitrogen as asparagine as compared with total nitrogen remained constant. N. H. J. M.

Influence of Anæsthetics on the Respiration of Plants. By N. MORKOWIN (*Exper. Stat. Record*, 1900, 12, 112—113; from *Rev. Gén. Bot.*, 1899, 11, 289—303).—Etiolated leaves and leaf buds of *Vicia faba* and *Lupinus luteus*, green leaves of *Ficus elastica* and *Phylodendron*, and embryos of sprouted wheat were subjected to the action of alcohol, ether, morphine hydrochloride, and solanine hydrochloride, in a Pettenkofer apparatus.

The results, in opposition to those of Bonnier and Mangin (*Ann. Sci. Nat.*, 1886, [vii], p. 5), showed that when the exposure to anæsthetics is prolonged for many hours, or even for several days, the intensity of respiration is considerably increased—by alcohol $1\frac{1}{2}$ times and by ether more than twice, in the case of *Vicia faba*. Morphine hydrochloride had no effect when the amount was 1:2000, but with 1:500 the respiration was increased $1\frac{1}{2}$ times.

In general, respiration was increased both in etiolated and in green plants. Alcohol (5 per cent.) checked the production of chlorophyll and the growth of the wheat germ. The diminution in respiration, in the case of plantlets, was in proportion to their growth.

N. H. J. M.

Presence of Copper in Plants and the Amount they may contain. By EDOUARD HECKEL (*Exper. Stat. Record*, 1900, 11, 1012—1013; from *Bul. Soc. Bot. France*, 1899, 46, 42—43).—Analyses of *Polycarpæa spirostylis* are given showing that one sample contained 30 mg. of copper per 1000 grams of dry matter, whilst other plants, growing in soil very rich in copper, contained as much as 500 mg. per kilogram. In Australia, the presence of *Polycarpæa* is thought to be an indication of copper in the soil. The ash of seeds of *Quassia gabonensis* was found to contain 0.698 per cent. of copper; the ash of the seeds, without the seed coat, contained only 0.254 per cent.

Viola calaminaria is said to contain considerable quantities of zinc, and the presence of the plant usually indicates zinc in the soil.

N. H. J. M.

Photosynthesis and the Coloration of Plants. By ED. GRIFFON (*Exper. Stat. Record*, 1900, 11, 1011—1012; from *Ann. Sci. Nat. Bot.*, 1899, [viii], 10, 1—123).—The deep green leaves of cereals, lettuce, begonias, and fuchsias possess a greater assimilative energy than the light green leaves, but the reverse holds good in the case of peaches, plums, cannas, and chrysanthemums. Red beets, purple filberts, purple sycamore, cannas and arums assimilated less than the

varieties with dark green leaves, whilst in the case of red atriplex and beech, which have the colouring matter in the epidermis, and the purple barberry, the colouring matter of which is in the palisade, assimilation was equal to that of the similar plants rich in chlorophyll.

Limodorum abortivum, a plant with highly coloured foliage and containing a good deal of chlorophyll, seems to be unable to utilise carbon dioxide. The addition of copper salts to nutritive solutions (1 : 10000 or 1 : 20000) attacks the roots of plants and retards growth; at the same time, the colour of the chloroleucites is increased and the intensity of the colour of the plant and the assimilative energy are materially increased.

Sodium chloride is unfavourable to chlorophyll production, and causes plants to acquire a characteristic greenish-yellow or pale green colour; the mesophyll of the leaf is thickened.

Excess of lime often results in chlorosis. In the case of pears and grapes, the photosynthesis is reduced to about one-fifth or one-sixth of that of normal leaves.

N. H. J. M.

Aldehyde in Green Leaves. By JOHANN REINKE and E. BRAUN-MÜLLER (*Exper. Stat. Record*, 1900, 11, 710; from *Ber. deut. bot. Ges.*, 1899, 17, 7—12, and *J. Roy. Micros. Soc.*, 1899, 499).—The results of a number of experiments made with various plants indicated that the amount of aldehyde decreases in absence of light. The conclusion is drawn that aldehyde is not the first product of assimilation.

N. H. J. M.

Hydrocyanic Acid in Plants. By MARCO SOAVE (*Exper. Stat. Record*, 1901, 12, 518; from *Nuov. Giorn. Bot. Ital.*, 1899, 6, 219—238, and *J. Roy. Micros. Soc.*, 1900, 343).—The results of experiments with bitter almonds and *Pangium edule* indicated that cyanogen compounds in plants are transitional substances which furnish the plant with nitrogenous food. From the time the seeds begin to swell, the bitter almond contains no hydrogen cyanide so long as the embryo is dormant. Hydrocyanic acid only appears when germination begins, and then only in the stem. Sweet almonds are said not to contain amygdalin.

N. H. J. M.

Mode of Formation of Asparagine in Plants. By ERNST SCHULZE (*Bied. Centr.*, 1901, 30, 106—108; from *Landw. Jahrb.*, 27, 503—516. Compare this vol., ii, 184).—The decomposition of proteids during germination probably always results in the production of leucine, aminovaleric acid, tyrosine, phenylalanine, and arginine; it is not at all improbable that asparagine and glutamine are directly formed to some extent. Most of the nitrogenous decomposition products break up further, leaving a residue (ammonia) which is utilised in the synthesis of asparagine and glutamine.

Asparagine is not only produced during germination, but also at subsequent periods, as, for instance, during the development of the leaf buds. It is not known whether the changes are similar to those which take place during germination; but there is no evidence to the contrary.

Asparagine also occurs in the roots of plants, sometimes in considerable quantity; amino-acids and other soluble crystallisable nitrogen

compounds generally accompany it. It is generally supposed that this asparagine is produced synthetically from inorganic nitrogen compounds acquired from the soil. Assuming that, in germination, asparagine is produced from ammonia, its mode of formation in germinating seeds would be the same as in roots.

N. H. J. M.

Synthesis of Proteids. By WILHELM PALLADIN (*Exper. Stat. Record*, 1900, 12, 310—311; from *J. Roy. Micros. Soc.*, 1900, 223. Compare Abstr., 1890, ii, 612).—Besides the intermediate products of the primary synthesis of proteids, there are products of the decomposition of proteids, intermediate products of the regeneration of the decomposition products, and various special decomposition products of the proteids. Decomposition of proteids only takes place in growing organs.

Uva lactuca and *Enteromorpha intestinalis* were found to contain asparagine, but not tyrosine; the first stage in the primary synthesis of proteid cannot be tyrosine, which, like asparagine, is thought to be a simple product of decomposition of proteid. Neither asparagine nor tyrosine was found in *Salicornia herbacea* or in the (August) leaves of *Dahlia variabilis*. Leaves of *Robinia pseudacacia* contained small amounts of asparagine, but no tyrosine.

N. H. J. M.

Influence of Carbohydrates on the Production of Proteids in Plants. By ERNST SCHULZE (*Bied. Centr.*, 1901, 30, 108—109; from *Landw. Jahrb.*, 27, 516—520).—In the germination of *Lupinus luteus* a considerable decomposition of proteid takes place. Most of the products are subsequently converted into asparagine, which accumulates in large amount, owing to the small quantity of glucose present being insufficient to enable it to be completely transformed into proteids. When the seedlings have been kept for some time in darkness and are exposed to light, a portion of the glucose produced is available for the regeneration of proteids, but inasmuch as there is a renewed production of asparagine from other products of the decomposition of proteids, there is an increase in the asparagine as well as in the proteids.

N. H. J. M.

Constituents of Jamaica Dog-wood. By PAUL C. FREER and A. M. CLOVER (*Pharm. Arch.*, 1901, 4, 21—28).—From the powdered bark of Jamaica dog-wood (*Piscidia erythrina*) water extracts the calcium salt of *piscidic acid*, $C_9H_8O(OH)_2(CO_2H)_2$, which was purified by means of its insoluble lead salt. This acid melts at 182—185°, its *ethyl hydrogen ester* at 207—208°, its *dianilide* at 196°, and its *diacetyl derivative* at 149—151°; in aqueous solution, bromine converts it into a *substance* melting at 234—236°, possibly a dibromo-additive product.

Chloroform extracts a number of substances from the bark. If the extract is diluted with ether, washed with aqueous potassium hydroxide, evaporated, the residue washed with boiling light petroleum, and then covered with ether, two *substances* crystallise out. One, $C_{21}H_{14}O_5(OMe)_2$, melts at 201°, and yields products, $C_{22}H_{20}O_8$ (yellow), and $C_{23}H_{20}O_7$, melting at 159° and 136°, when heated with dilute and strong methyl alcoholic potassium hydroxide respectively. The other, $C_{20}H_{12}O_4(OMe)_2$, is yellow and melts at 216°. Hart's piscidin (Abstr.,

1884, 332) is a mixture of these two substances, and in reality is physiologically inert. Addition of light petroleum to the ethereal mother liquor of the crystals just described precipitates a *substance*, probably $C_{25}H_{22}O_7$, melting at 159° . On evaporation of the residual liquid, a *substance* melting at $50-80^\circ$ is left, probably a glucoside; when heated with slightly acidified alcohol, it yields some of the substance melting at 216° . A fifth *substance*, $C_{20}H_{20}O_5(OH)_2$, insoluble in light petroleum and melting at $150-155^\circ$, is also described as obtained from the chloroform extract; it forms a *diacetyl* derivative melting at 183° , and, when treated with potassium hydroxide and methyl iodide, a substance melting at $141-142^\circ$, described as probably a *dimethyl* derivative, although the formula $C_{20}H_{20}O_6$ is assigned to it. The substance itself is hydrolysed to a *product*, $C_{18}H_{14}O_4(OH)_2$, which melts at 275° , and forms a *diacetyl* derivative melting at $177-178^\circ$.

C. F. B.

Samadera Indica. By J. L. B. VAN DER MARCK (*Arch. Pharm.*, 1901, 239, 96-113).—A morphological description of the drug is given first. Then follows an account of the chemical investigation, for the details of which the original paper must be consulted. Most of the substances isolated were obtained in very small amount, often only a few hundredths of a gram from several kilograms of material. From the seeds were obtained:—(1) A fatty oil, forming 63 per cent. of the whole, and consisting of triolein 88, tripalmitin 8, and tristearin 4 per cent.; (2) a proteid, soluble in alcohol and in water, and containing 18 per cent. of nitrogen; (3) sucrose; (4) a sugar that reduces Fehling's solution directly; (5) inositol; (6) a crystalline bitter-substance. From the bark:—(1) The same bitter-substance as from the seeds; (2) a crystalline bitter-substance crystallising in yellow plates, probably an anthraquinone derivative; (3) a tannic acid belonging to the group of the phloroglucotannoids; (4) ellagotannic acid; (5) a tannic acid closely resembling tannin; (6) a large amount of inorganic salts. From the wood:—(1) A bitter-substance crystallising in yellow, rhombic prisms; (2) a bitter-substance very closely allied to quassin.

The bitter-substance that occurs in both seeds and barks crystallises in monoclinic plates, melts at 255° , and decomposes at 260° , and has $n_{1.624}$ and $[\alpha]_D + 250^\circ$. It contains no water of crystallisation, and has the composition $C_{29}H_{34}O_{11}$. With phenylhydrazine, it yields a yellowish, crystalline substance, melting at 214° ; no methoxyl or ethoxyl group is present. It gives a violet coloration with strong sulphuric acid, and has a poisonous action on frogs, less so on guinea-pigs and rabbits. Most probably it is identical with the samaderin of Rost van Tonningen.

C. F. B.

Some Physiological Effects of Hydrogen Cyanide on Plants. By W. G. JOHNSON (*Exper. Stat. Record*, 1900, 11, 1009-1010; from *Sci. Amer. Sup.*, 1899, 48, No. 1249, 20026-20027).—Hydrogen cyanide seems to be most injurious to foliage during sunshiny days, late in the autumn, between 9 a.m. and 4 p.m.; at other hours, even in sunshine, the leaves were little affected, and no injury

takes place at night. Dormant leaves of fruit trees were not injured by 0.2 gram of hydrogen cyanide per cubic foot.

Apple and pear trees remain practically uninjured by the strongest applications; plum trees are more susceptible, being injured by 0.65 gram of hydrogen cyanide per cubic foot. Peach trees, well matured, are injured by 0.5 gram, whilst low grade peach trees are killed when more than 0.18 gram is present.

N. H. J. M.

Sensibility of Higher Plants to very Feeble Amounts of Toxic Substances. By HENRI COUPIN (*Compt. rend.*, 1901, 132, 645—647. Compare Abstr., 1899, ii, 118 and 242; 1900, ii, 236 and 363; also Dehérain and Demoussy, this vol., ii, 266).—The toxic effect of various salts was determined by observing the length of roots of wheat plants after 15 days of growth in the various solutions, as compared with the roots obtained in pure distilled water (30 cm.). The following amounts of salts were found to be toxic :

CuSO ₄	1/700000000	K ₂ Mn ₂ O ₈ ..	1/15000	Ba(NO ₃) ₂ ..	1/4200
HgCl ₂	1/30000000	Mn(NO ₃) ₂ ..	1/13000	Li ₂ SO ₄	1/4000
CdCl ₂	1/10000000	LiCl	1/12000	NaOAc.....	1/2000
Ag ₂ SO ₄	1/2000000	Al ₂ Cl ₆	1/10000	Mg(OAc) ₂ ..	1/2000
AgNO ₃ ...	1/1000000	MgI ₂	1/10000	Na ₂ B ₄ O ₇ ...	1/1000
PdCl ₂	1/500000	BaCl ₂	1/10000	Ba(OAc) ₂ ..	1/1000
Pb(NO ₃) ₂ ..	1/100000	CaI ₂	1/10000	MnCl ₂	1/1000
Al ₂ (SO ₄) ₃ ...	1/50000	Sr(NO ₃) ₂ ...	1/6000	CaBr ₂	1/400
ZnSO ₄	1/40000	LiNO ₃	1/5000	CaCl ₂	1/260

The above amounts do not kill the plants, but injure the roots. Metallic mercury under water had no effect. The vapour emitted by mercury in air (not covered by water) is known to be injurious to vegetation (compare this vol., ii, 269).

N. H. J. M.

Forcing Plants with Ether. By J. FISCHER (*Exper. Stat. Record*, 1900, 12, 243—244; from *Amer. Gard.*, 1900, 21, 358—360 and 372—373).—Treatment with ether is almost without action during the first and second portions of the resting period of plants; treatment during the last portion of the resting period (from the end of October to the end of December in the case of lilac) has a very stimulating effect. Shrubs may in this manner be forced 3—6 weeks earlier than by the usual methods. Etherised tulips were 8—12 days earlier than those without the treatment, but they did not hold the bloom so well. In the case of bulbs, growth is retarded if they are subjected to the action of ether before roots are formed. The beech was considerably retarded by ether. The colour of lilac was weaker in the case of plants treated with ether than in plants grown under ordinary conditions.

In the case of shrubs, the amount of ether employed was 1½ oz. to 40 gallons of air in the vapour-proof chamber.

Well developed flowers and improved colours were obtained by exposing plants which have been treated with ether to full light at temperatures from 50—54° F. (lilac) to 62—72° F. (Marly Rouge).

N. H. J. M.

Variation in the Amounts of Gluten in Wheat. By LÉO VIGNON and F. COUTOURIER (*Compt. rend.*, 1901, 132, 791—794).—Different

varieties of wheat were grown on small plots (10 sq. m.) manured with the same amounts of phosphatic and potassium manures and different amounts of nitrogenous manures (35, 55, and 75 kilos. per hectare). The results show that the percentage of gluten increased with the amount of nitrogen applied. The increase was slow, and it is probable that in practice a limit would soon be reached.

Similar experiments with phosphoric acid showed a diminution in the amount of nitrogen when the phosphoric acid was increased from 75 to 150 and 225 kilos. per hectare. Millon found (*Compt. rend.*, 1854, 38, 95) that wheat grown in 1848 in the north of France contained 10.23 to 13.02 per cent. of gluten. At the present time, the percentage of gluten is 8.96 to 10.62. This diminution is attributed, not to loss of nitrogen in the soil, but to the large amounts of phosphatic manures which have been employed. N. H. J. M.

Analyses of Norwegian Barley. By FR. H. WERENSKIÖLD (*Bied. Centr.*, 1901, 30, 111—113; from *Tidsskr. Norsk. Landbr.*, 1900, 7, 68—74, and 109—114).—A number of results of analyses of Norwegian barley are given. On the whole, the results are considered satisfactory as regards the prospect of the production of malt-barley in Norway. N. H. J. M.

Sunflower Plant. By HARVEY W. WILEY (*U.S. Dept. Agr. Div. of Chem. Bul.*, 60, 1901, pp. 31. Compare *Ann. Rep. New York Agr. Expt. Stat.*, 2, 1883; *Ann. Rep. Maine Agr. Expt. Stat. for 1895*; and *Ann. Rep. Vermont Agr. Expt. Stat.*, 1893).—The first portions of the paper deal with the botanical description, medicinal uses, and the cultivation of the sunflower. The composition of the different parts of the plant is as follows:

	Water.	Ether extract.	Crude fibre.	Proteid.	Carbo- hydrates.	Ash.
1. Seeds	4.43	27.08	29.17	14.97	20.94	3.41
2. Stems.....	8.79	1.83	43.30	4.47	32.49	9.12
3. Leaves	12.51	4.09	13.16	10.15	38.83	21.26
4. Heads, without seeds and husks	7.40	5.07	18.44	9.91	39.79	19.39
5. Husks	8.32	5.23	17.74	6.13	51.50	11.08
6. Kernels	4.89	45.21	2.67	26.85	16.06	4.32
7. Seed shells	6.16	1.67	63.75	3.00	23.22	2.20

The ash of the various parts had the following composition:

	K ₂ O.	Na ₂ O.	CaO.	MgO.	Fe ₂ O ₃ .	P ₂ O ₅ .	SO ₃ .	SiO ₂ .	Cl.
1.	29.02	1.12	9.43	17.90	0.46	38.40	2.87	0.38	0.54
2.	38.94	3.84	21.08	19.88	1.22	1.54	3.53	1.31	7.30
3.	8.04	0.94	44.00	21.52	2.77	3.28	4.46	13.85	1.47
4.	54.24	0.42	16.61	10.01	0.67	4.44	5.50	1.43	8.62
5.	55.66	1.65	20.08	9.47	0.91	3.73	2.94	2.00	4.59
6.	25.50	0.81	6.58	14.70	0.42	50.84	0.97	0.15	0.08
7.	47.36	0.99	20.91	15.88	1.09	6.83	4.98	0.80	1.50

The results show that sunflower is an exhausting crop, especially as regards nitrogen, potash, and phosphoric acid. The oil, which is present in the seeds in large amounts, is one of the most valuable constituents of the plant. The residual cake is at least equal in value to flax seed and cotton seed cakes, N. H. J. M.

Chemical Study of Seed Mangolds. By MARCEL GERBIDON (*Ann. Agron.*, 1901, 27, 135—144).—Mangolds were sown in the spring, and the crop taken up in September of the following year. The composition of (1) the roots, (2) the stalks, and (3) the seed was as follows :

	Water, per cent.	Per cent. in dry matter.					
		Nitrogen.	Ash.	K ₂ O.	CaO.	MgO.	P ₂ O ₅ .
1.	90.60	0.574	13.71	3.20	0.54	0.26	0.31
2.	10.33	0.526	9.58	2.30	0.70	0.09	0.24
3.	9.00	1.738	7.54	1.79	0.71	0.79	1.15

The yields per hectare of roots, stems, and seeds were 8142, 1850, and 1500 kilos. As a rule, the roots are useless for feeding, but in some seasons they remain succulent, and are suitable for feeding cows. The roots which have produced seed are inferior, especially as regards saccharine and amylaceous constituents, to feeding roots, but the difference is less than might be expected. Seed roots which have failed to produce seed are superior to ordinary feeding roots, having had a longer period in which to accumulate nutritive reserves. Roots which in September, 1899, contained 0.574 per cent. of nitrogen in the dry matter were found to contain 1.232 per cent. in 1900; the yield of seed, which should have been about 1500 kilos. per hectare, fell to about 500 kilos. This is attributed to the very dry season; the roots had accumulated reserve matters, but when the time came for migration to the stems and flowers, the movement was checked by dry weather.

N. H. J. M.

Study of Rations fed to Milch Cows in Connecticut. By WIEBUR O. ATWATER and C. S. PHELPS (10th *Ann. Rep. Storrs Agr. Expt. Stat.* for 1897, 17—66).—Forty-five experiments on thirty-two distinct herds are described. The average yields of milk and butter were 13.2—23.4 and 0.7—1.33 lbs. per day respectively.

☞ Nitrogenous foods (clover, oats, and peas, cotton seed, linseed, and gluten meals) should be more largely employed. Rations should be made more in accordance with the yield of milk than with the live weight, and with a uniform flow of milk the food need not vary much for variations of 100—200 lbs. live weight. With an increase in the yield of milk, the ration should be increased, the proteids being increased both in quantity and relatively.

N. H. J. M.

Feeding Experiments with Molasses and Maize-germ Molasses. By MAX GERLACH (*Bied. Centr.*, 1901, 30, 102—104; from *Jahresber. landw. Versuchsstat. Jersitz b. Posen*, 1898—1899, 48).—Two series of experiments with cows are described. The results indicate that maize-germ molasses may advantageously be replaced by a mixture of liquid molasses, wheat husks, and palm kernel cake.

In pig-feeding experiments, it was found that maize-germ molasses produced 0.65 cwt. more meat than crushed rye.

N. H. J. M.

Feeding Experiments in 1898 and 1899, at Lauchstädt, with Bullocks, Pigs, and Lambs. By FRIEDRICH ALBERT (*Bied. Centr.*, 1901, 30, 94—101; from *Landw. Jahrb.*, 1899, 28, 943—995).—To obtain, with pigs, an increase of 0.5 kilo. or more per day, a

ration containing 5 kilos. of digestible proteid per 1000 kilos. of live weight and 28 kilos. of digestible non-nitrogenous matter was found to be suitable; a greater amount of proteids, even with 40 kilos. of non-nitrogenous food, does not give better results than the normal ration. The proteids in fattening rations may be given in the form of meat meal when only an increase of live weight is required. Sugar is a very suitable food when the fattening ration contains 40 kilos. of non-nitrogenous matter (including non-proteids), in addition to 5 kilos. of proteid per 1000 kilos. live weight.

As regards the quality of the meat, the effect of feeding was found to be of less importance than the individual character of the pig.

The results of experiments with bullocks showed that Liebig's meat meal is very suitable; cocoa-husks were found to have a value intermediate between meadow hay and wheat husks, and may be given in amounts of 5 kilos. per 1000 kilos. live weight.

As regards the effect of different kinds of fat in fattening lambs, it was found that sunflower cake gave the best results, being favourable both in increasing the live weight and in improving the meat and fat; rape cake and bran gave good results, but peas, and especially earth-nut cake, were less satisfactory in their effect on the nature of the fat produced.

Maize-germ molasses gave very satisfactory results with lambs.

N. H. J. M.

Factors determining the Richness of Milk. By C. D. SMITH (*Exper. Stat. Record*, 1900, 11, 779; from *Proc. Soc. Prom. Agr. Science*, 1898, 152—155).—From the records of a herd of 25 cows during five years, at the Michigan station, and of 8 cows at the New York State station, the following conclusions are drawn. The milk of a heifer is of as good quality as that of the matured cow. During the first month of lactation the milk is as rich as at any subsequent period, except, perhaps the last few weeks. Season has little effect on the quality of the milk; when cows are at pasture the milk is, on the average, neither richer nor poorer than during winter feeding.

N. H. J. M.

Composition of Sow's Milk. By FRITZ W. WOLL (*Exper. Stat. Record*, 1900, 12, 84; from *Wisconsin Stat. Rep.*, 1899, 267—270. Compare Abstr., 1898, ii, 299).—Analyses of five samples of sow's milk were made. The average composition of sow's milk, according to these and the previous seven analyses, is as follows:—Water, 81.49; fat, 6.60; casein and albumin, 5.75; milk sugar, 5.19; solids not fat, 11.91; ash, 0.97 per cent.

The results of 74 analyses, by the author and others, gives 6.61 as the average percentage amount of fat in sow's milk; this is about 3 per cent. higher than the amount in the milk of cows in the United States.

N. H. J. M.

Soluble Salts of Cultivated Soils. By F. H. KING and J. A. JEFFREY (16th *Ann. Rep. Wisconsin Agr. Expt. Stat. for 1898—1899*, 219—243).—Results of determinations of the soluble salts in soils, at different dates, showed a considerable increase from May to September.

In the first 12 inches of soil, the amount of soluble salts increased from 211·9 to 447·5 lbs. per acre, whilst in the second, third, and fourth 12 inches the amounts increased from 240·2, 164·7, and 59·6 to 347·1, 200·1, and 78·8 lbs. respectively. In the case of plots under growing crops there was a slight tendency for the amount of soluble salts in the upper four feet of soil to decrease rather than increase; but there was no regular decrease in proportion to the amount of dry matter in the produce. Nitric acid was determined in May and in August in the upper four feet of the soil of five plots; two were worked once a week to depths of two and three inches; two once in two weeks to the same depths, whilst the fifth was left. The total gain in nitric acid was from 307 to 378 lbs. per acre, the differences due to different treatment being small; but possibly the results are obscured by variations in the amounts of evaporation.

To ascertain the effect of irrigation on the amount of nitric acid in the soil, determinations were made in the first three feet of soil, which had been irrigated some months previously, and on soil which was not irrigated. Although the irrigated soil had produced the greater crop of maize, it still showed a higher percentage of nitric acid.

N. H. J. M.

Chemical Study of the Phosphoric Acid and Potash Contents of the Wheat Soils of Broadbalk Field, Rothamsted. By BERNARD DYER (*Proc. Roy. Soc.*, 1901, 68, 11—14. Compare *Trans.*, 1894, 65, 115).—Determinations of phosphoric acid and potash (soluble in hydrochloric acid and in 1 per cent. citric acid) were made in 51 samples of Broadbalk soil, including samples taken at three depths of 9 inches, from 12 plots, after the fiftieth crop of wheat had been cut, as well as some earlier samples of surface and subsoil taken in 1881 and in 1865 respectively.

As regards total phosphoric acid, the amounts found in the unmanured and the variously manured soils correspond fairly well with their history; in absence of a known history, the results would not furnish very clear indications. In the case of the subsoils, the irregularities in the soil itself are so great that the total percentage tells nothing.

In the case of phosphoric acid soluble in citric acid, the results obtained both with surface- and frequently with sub-soils are very striking, showing marked accordance with the known history of the plots. In the surface-soils, the average ratio of total phosphoric acid in the soil of the plots manured with superphosphate (with ammonium salts, and both with and without other minerals) to that in the plots which had no phosphoric acid was 1·65 : 1, whilst the ratio of the phosphoric acid soluble in citric acid was 5·46 : 1 for the same groups. The ratios of total phosphoric acid in the two dunged plots to that of the plots receiving no phosphate were 1·78 and 1·36 : 1; the corresponding ratios for soluble phosphoric acid were 6·83 and 3·91 : 1.

The results seem to indicate that for cereals the limit denoting deficiency in phosphoric acid is between 0·01 and 0·03 per cent. soluble in citric acid. In root crops, especially turnips, the limit would probably be higher. By far the greater proportion of phosphoric acid

applied as manure and originally soluble in water is accumulated in the first 9 inches of soil; in the dunged plots, a good deal was found in the second and third 9 inches, and where potassium, sodium, and magnesium salts had been applied without nitrogen, there was evidence of a tangible descent into the second and even third 9 inches of soil. These salts have a distinct influence in retaining phosphoric acid in a less fixed and presumably more available condition. The excess of phosphoric acid applied to the dunged plots is less satisfactorily accounted for; a greater amount has probably passed down to the subsoil than is the case with the chemically manured plots, and some may have become fixed in unavailable forms.

The results of determinations of potassium soluble in strong hydrochloric acid are of interest, but such determinations would, in absence of a known soil history, be of little value except in extreme cases. The citric acid results are, however, very consistent. The ratio of soluble potassium in the surface soil of three plots manured with potassium salts to the average amount of seven plots which had no potassium was 6.75:1; the dunged plots as compared with the same seven plots gave the ratios 10.67 and 9.17:1.

Soil containing 0.01 per cent. of potassium soluble in 1 per cent. citric acid probably requires no further application.

Most of the excess of potassium, applied as manure, is in the first 9 inches of the soil, but a good deal was found (soluble in citric acid) in the second and third 9 inches, especially in the dunged plots and the plot which received superphosphate and sodium and magnesium salts (but no nitrogen) in addition to potassium. Sodium and magnesium salts help to maintain potassium in a form soluble in citric acid. Potassium, although retained by clayey soil to a greater extent than sodium, is far more migratory than phosphoric acid; probably a certain amount is deposited in forms insoluble in dilute citric acid.

N. H. J. M.

Effectiveness of Potassium Nitrate as compared with like amounts of Nitrogen and Potassium in the Form of Potassium Chloride and Sodium Nitrate. By HOMER J. WHEELER and J. A. TILLINGHAST (*Exper. Stat. Record*, 1900, 11, 914—915; from *Rhode Island Stat. Rep.*, 1898, 133—136).—Concordant results were obtained in experiments with grass and mangel-wurzels, indicating that the total yield is greater when sodium nitrate and potassium chloride are applied together than when the same amounts of nitrogen and potassium are given in the form of potassium nitrate. Some special value must therefore be ascribed to sodium or chlorine, or perhaps to both.

N. H. J. M.

Manurial Experiments with Ammonium Sulphate and Sodium Nitrate. By KRAUS (*Bied. Centr.*, 1901, 30, 84—87; from *Vierteljahresschr. Bay. Landw.-rat.*, 1900, 5, 1).—Experiments with barley in 1898 and in 1899 in which sodium nitrate and ammonium sulphate were applied at the same date, showed that both manures gave practically the same results. In 1899, sodium nitrate was applied to a third plot in two lots (two and four weeks later than the application

of nitrate and ammonium sulphate to the other plots); the yield of grain and straw was somewhat increased. N. H. J. M.

Investigations Relative to the Use of Nitrogenous Materials [as Manures]. By E. B. VOORHEES (*Exper. Stat. Record*, 1900, 12, 322—323; from *New Jersey Stat. Rep.*, 1899, 97—120).—Cow dung and a mixture of cow dung and urine were exposed to fermentation and leaching in the open air, in lots of 100 lbs., for about 4 months. The weights were reduced to 50 and 61 lbs. respectively. The dung alone lost nitrogen (46), potash (80), and phosphoric acid (72 per cent.), whilst the mixed excrement lost 57, 72, and 62 per cent. respectively.

Manurial experiments were made on the availability of fresh and leached dung and mixed excrement, both alone and with sodium nitrate, ammonium sulphate, and dried blood. The plants selected were maize and tomatoes, which were grown in a medium clay and in sandy loam respectively, in large, bottomless cylinders. The largest applications of manure were 20 tons per acre.

The results with maize showed, in every case, a distinct gain of dry matter, due to nitrogenous manure, and a considerable, but variable, gain of nitrogen. The total recovery of nitrogen was always greater with mixed materials than when the materials were used singly. The results with dung and sodium nitrate seem to indicate that nitrogen was not lost by denitrification, but that the losses were due to other causes.

The relative availability of the nitrogen, based on the recovery of nitrogen in the crop, was found to be as follows: sodium nitrate, 100; ammonium sulphate, 99.5; dried blood, 95.4; fresh cow dung, 16.76; leached cow dung, 37.86; fresh mixed excrement, 49.66; leached mixed excrement, 50.38. N. H. J. M.

Guano from Erythræa. By G. AMPOLA (*Chem. Centr.*, 1901, i, 757; from *Staz. sperim. agrar. ital.*, 34, 53—59).—The guano contains

Mois- ture.	Organic substance.	P ₂ O ₅ .	SO ₃ .	CO ₂ .	Cl.	CaO.	MgO.	K ₂ O.	Na ₂ O.
6.84	28.45	5.38	2.54	19.59	1.41	31.54	1.2	1.48	1.57

with traces of ferric oxide, alumina, and silica. The organic substance contains 0.0514 per cent. of ammoniacal nitrogen, and 1.311 per cent. of uric acid; there is no citrate-soluble phosphoric acid. M. J. S.

Box Experiments with Phosphoric Acid from Different Sources. By L. H. MERRILL (*Exper. Stat. Record*, 1900, 11, 913—914; from *Maine Stat. Rep.*, 1898, 64—74).—The experiments included plants of the following orders: *Leguminosæ* (4), *Cruciferae* (4), *Gramineæ* (4), *Solanaceæ* (2), *Umbelliferae* (2), *Polygonaceæ* (1), and *Compositæ* (1 plant).

It was found that plants differed in their ability to feed on crude phosphates. Turnips, cauliflowers, and kohlrabi gave almost as good results with Florida rock as with acid rock, whilst in every other case the good effect of the acid rock was very marked. Barley, maize, and oats seem to require an acid phosphate.

The amount of phosphoric acid soluble in ammonium citrate is not always a measure of its value to the plant. N. H. J. M.

Locusts as Manure. By J. HÜNCKEL D'HERCULAIS (*Exper. Stat. Record*, 1900, 11, 913; from *Min. Agr. Argentine Republic*, 1899, pp. 12).—The composition of locusts, according to the analyses of Müntz and Girard, is as follows. In fresh substance, $N=3.15$; $K_2O=0.28$; $P_2O_5=0.60$ per cent. The dry matter contains $N, 11.50$; $K_2O, 1.02$; $P_2O_5, 2.18$, and the dry matter freed from fat, $N, 14.00$; $K_2O, 1.60$, and $P_2O_5, 2.50$ per cent.

When employed alone (400 to 600 kilos. per hectare), locusts were not very effective, but much better results were obtained with a mixture of locusts and superphosphate. Extracting the fat would increase the manurial effect, and would render the decomposition of the locusts inoffensive. N. H. J. M.

Analytical Chemistry.

Improvement in Orsat's Apparatus. By A. BEMENT (*J. Amer. Chem. Soc.*, 1901, 23, 57—58).—A glass disc with a corrugated edge, is interposed between the outlet of the Orsat pipette and the tubes inclosed in the front limb, so that one of the tubes may not drop into the outlet. L. DE K.

Test for Chlorine for Use with the Blowpipe. By HENRY W. NICHOLS (*Amer. Chem. J.*, 1901, 25, 315—317).—The substance to be tested is powdered, mixed with some previously ignited potassium hydrogen sulphate, and then fused in a tube. Filter paper is moistened with cobalt nitrate solution, and held at the mouth of the tube; if chlorides were originally present, the paper turns a bright blue under the combined action of hydrogen chloride and sulphuric anhydride. Bromides and iodides give a green colour; if both chloride and bromide are present, the colour is first blue and then green. In some cases, especially if much water is given off, it is necessary to dry the paper before the change in colour becomes visible. J. J. S.

Estimation of Hydrochloric Acid in Gastric Juice. By LÉON MEUNIER (*Compt. rend. Soc. Biol.*, 1901, 53, 283—284).—Colorimetric methods are employed. Toppfer's reaction with dimethyl-aminoazobenzene is rapid and correct. Günzburg's reaction with phloroglucinol-vanillin gives constant results, but is not so quick. W. D. H.

Method for preparing Normal, Seminormal, Decinormal, &c., Sulphuric Acid of Exact Strength. By RICHARD K. MEADE (*J. Amer. Chem. Soc.*, 1901, 23, 12—15).—A normal sulphuric acid is best prepared by dissolving 124.87 grams of pure crystallised

copper sulphate in 800 c.c. of water, and submitting this solution to electrolysis as directed by Hart and Crossdale (*Abstr.*, 1891, 959), using a current of 2.5 amperes. The copper is generally completely precipitated after 12 hours, and the liquid is then made up to exactly 1 litre.

To prepare a decinormal solution, 12.487 grams of crystallised copper sulphate are dissolved in 750 c.c. of water, and submitted to the action of a current of 1.5 amperes for about 8 hours. The liquid is decanted, the copper well washed, and the whole diluted to 1 litre. (Compare also Kohn, this vol., ii, 190.)

L. DE K.

Estimation of Organic Nitrogen by the Processes of Kjeldahl and Will and Varrentrap. By ALPH VAN ENGELEN (*Rev. Intern. Falsific*, 1901, 14, 14—18).—Kjeldahl's process and its various modifications are reviewed. Experiments with leaves of pear-trees and cotton seed meal showed that the highest percentage of nitrogen is obtained by closely following Kjeldahl's original directions, namely, heating for 2 or 3 hours with sulphuric acid, and adding potassium permanganate. For laboratories where nitrogen estimations are not of frequent occurrence, it is more convenient to use Will and Varrentrap's combustion process; the author uses an iron combustion tube.

L. DE K.

The Blondlot-Dusart Method in Chemico-legal cases. By Z. HALÁSZ (*Zeit. anorg. Chem.*, 1901, 26, 438—450).—The author has examined, by the Blondlot-Dusart method, the organs, and especially the brains, of animals which have been poisoned by phosphorus, and those not so poisoned. Tables are given containing the results of the experiments. These show the untrustworthiness of the method. In the case of dogs poisoned by phosphorus, no indication of phosphorus or phosphine was obtained from the brain, but in the stomach, intestines, liver, lungs and kidneys, a smaller or larger indication of phosphorus was always obtained.

E. C. R.

Estimation of Phosphorus in Steel and Iron. By FRED IBBOTSON and HARRY BREARLEY (*Chem. News*, 1901, 83, 122).—When using the lead molybdate method for estimating phosphorus in iron and steel (*Abstr.*, 1900, ii, 757), the graphite may be removed either before or after oxidising with permanganate; in the final stage, after dissolving the yellow precipitate in ammonia, and washing the filter, the solution may be treated with 50 c.c. of a solution containing 8 grams of lead acetate and 400 c.c. of acetic acid (B.P.) in a litre, and the white precipitate ignited and weighed; it contains 0.644 per cent. of phosphorus. For success, many precautions are necessary, and are duly set forth.

Arsenic, if present, is not precipitated with the phosphorus when the precipitation is rapidly effected.

Steels containing 2 to 3 per cent. of chromium frequently dissolve imperfectly in nitric acid of sp. gr. 1.20, even when digested with permanganate, but the addition of an equal bulk of hot water restarts the activity; or hydrofluoric acid may be used for the same purpose,

or 5 c.c. of dilute sulphuric acid (1:3), when a further 2 or 3 c.c. of ammonia must be added before precipitating the phosphoric acid.

D. A. L.

Kilgore's Modification of the Volumetric Method of Estimating Phosphoric Acid. By C. B. WILLIAMS (*J. Amer. Chem. Soc.*, 1901, 23, 8--12).—Kilgore's process, titration of the yellow molybdate precipitate with standard solutions of potassium hydroxide and nitric acid (Abstr., 1896, ii, 335), is strongly recommended.

The author prefers diluting the alkali and the acid to such a strength that 1 c.c. shall correspond with 0.0005 gram of phosphoric anhydride.

L. DE K.

Estimation of Phosphoric Acid in Wines by the Official Method. By A. SARTORI (*Chem. Zeit.*, 1901, 25, 263--264).—A criticism of the German official method for estimating phosphoric acid in the ash of wines by the molybdic acid method.

It is stated that the results will be too low unless the temperature at the time of precipitation is raised to 100°; the liquid should also be concentrated to a small volume. The strength of the ammonia when finally precipitating the phosphoric acid with magnesia mixture is not stated in the official instructions, although it is not without influence on the solubility of the precipitate.

L. DE K.

Estimation of Phosphoric Acid in Wines by the Official Method. By RUDOLF WÖY (*Chem. Zeit.*, 1901, 25, 291).—A reply to Sartori (see preceding abstract). The reason that a portion of the phosphoric acid is not precipitated by the molybdate reagent at 80° but only slowly at a higher temperature is explained by the presence of pyrophosphoric acid. In the official process, the ash obtained by evaporating the wine with sodium carbonate and nitre and igniting the residue still contains carbon, which cannot be completely freed from phosphates even by boiling with nitric acid, but requires reburning, which favours the formation of pyrophosphates.

L. DE K.

Estimation of Phosphates in Potable Waters. By A. G. WOODMAN and L. L. CAYVAN (*J. Amer. Chem. Soc.*, 1901, 23, 96--107).—The colorimetric process for the estimation of phosphoric acid in water is criticised at length. As the result of many experiments, the following method is recommended. Fifty c.c. of the sample are mixed with 3 c.c. of nitric acid of sp. gr. 1.07 and evaporated to dryness on the water-bath; the residue is dried in a water oven for 2 hours to render any silica insoluble. The mass is then dissolved in 50 c.c. of water and, without filtering, introduced into the comparison tube. The tubes which have been found to answer best have a capacity of 100 c.c. and are made of hard white glass, about 2.5 cm. in diameter and 24 cm. long to the 100 c.c. mark. Four c.c. of solution of ammonium molybdate (50 grams in 1 litre) and 2 c.c. of nitric acid of sp. gr. 1.07 are added and after 3 minutes the colour is compared with standards made by diluting varying quantities of standard solution of sodium phosphate (1 c.c. = 0.0001 gram P_2O_5) to 50 c.c. and adding the reagents as before. The test analyses are very satisfactory.

L. DE K.

Detection of Arsenic in Beers, Brewing Materials, and Food. By WILLIAM THOMSON and JAMES PORTER SHENTON (*J. Soc. Chem. Ind.*, 1901, 20, 204—208).—Both sulphuric and hydrochloric acids can be freed from arsenic by distillation after adding chromic acid to convert arsenious into arsenic acid. The hydrochloric acid will then be contaminated with chlorine, which must be removed by adding phenol. In Marsh's apparatus, rubber stoppers should be avoided, as they are liable to introduce both antimony and arsenic. Small generating flasks (50 c.c.) one-third filled with zinc are recommended. Granulated zinc is preferred, but the authors have obtained anomalous and unexplained results with various specimens of rod and granulated zinc. The addition of platinic chloride to promote the evolution of hydrogen is deprecated, but it is stated that copper sulphate may be added without seriously diminishing the amount of arsine evolved. The method is made quantitative by preparing comparison mirrors. Beer (50 c.c.) or malt (5 grams) is prepared for testing by destroying the organic matter with sulphuric and nitric acids and then further concentrating to expel the latter. The solution is then diluted and added gradually to the Marsh apparatus from a small stopcock burette.

The authors speak with commendation of the Gutzeit test, and are of opinion that Tyrer's mode of conducting it is an improvement on the original form. In this modification, the gas is freed from hydrogen sulphide by being passed through potash bulbs containing a strong solution of lead acetate, instead of over dry lead acetate paper.

M. J. S.

Estimation of Arsenic and Antimony in Cupreous Materials. By ALLAN GIBB (*J. Soc. Chem. Ind.*, 1901, 20, 184—188).—The substance is dissolved in aqua regia; a small quantity of ferric chloride is added, and then, while heating, sodium carbonate until a small permanent precipitate forms, which contains all the arsenic and antimony as basic ferric salts; this is collected on a filter and washed with hot water until free from nitrates. It is then placed in a fractionating flask with 50 c.c. of a mixture of zinc chloride, cupric chloride, and hydrochloric acid of such concentration as to boil at 108°. About 0.25 gram of pure copper is added, the function of which is to reduce the antimonious and arsenic acids. The neck of the flask is closed by a rubber stopper carrying a thermometer and a stopcock separating bulb, and its side tube is bent and connected with a U-tube containing water and cooled. The mixture is distilled until the boiling point rises to 115°. At that temperature, the whole of the arsenic but none of the antimony will have distilled over. A fresh U-tube is adjusted and the temperature is raised to 150—160°. About 10 c.c. of hydrochloric acid is then cautiously run in. Its vapour sweeps all the antimonious chloride into the U-tube. To this tube tartaric acid is added, the two distillates are nearly neutralised, mixed with sodium hydrogen carbonate, and titrated with *N*/150 iodine.

If the substance to be analysed is readily dissolved by boiling with the cupric zinc chloride solution, it may be introduced into the distillation flask without the preliminary treatment. It is claimed that the

method is more rapid than any other, and if various minor details are attended to is of great accuracy. M. J. S.

Soluble Arsenious Oxide in Paris Green. By SAMUEL AVERY and H. T. BEANS (*J. Amer. Chem. Soc.*, 1901, 23, 111—117).—A criticism of the methods employed by Haywood (*Abstr.*, 1900, ii, 758) and Hilgard (*ibid.*, 578). In estimating soluble arsenious oxide in Paris green, it must be remembered that the arsenical copper compound is somewhat easily hydrolysed and also that it is partly decomposed by carbon dioxide, particularly if the sample is finely divided.

The following process for the estimation of the soluble arsenious oxide is proposed. One gram of the sample is digested over an open flame with 25 c.c. of a solution of sodium acetate containing 12.5 grams of the crystallised salt. When cold, the solution is made up to 100 c.c. and 50 c.c. are filtered and titrated with standard solution of iodine in the usual way. The presence of sodium acetate largely prevents the hydrolysing action of the water, but no great accuracy is claimed for the process. L. DE K.

Testing Food Products for Boric Acid with Turmeric Paper. By EDWARD H. JENKINS and A. W. OGDEN (*Exper. Stat. Record*, 1900, 12, 213—214; from *Connecticut State Stat. Rep.*, 1899, 153—155).—Free boric acid cannot be readily detected with turmeric paper in presence of borates. Hydrochloric acid must be added in considerable excess. When less than 1 part of boric acid is present in 10,000 parts of solution, certain results are not to be expected.

N. H. J. M.

Sodium Ferrisalicylate; Estimation of Boric Acid in Borates of the Alkalis and Alkaline Earths. By JULES WOLFF (*Zeit. Nahr. Genussm.*, 1901, 4, 157—160. Compare *Abstr.*, 1900, ii, 435).—The indicator is best prepared by saturating a concentrated solution of normal sodium salicylate with freshly precipitated well-washed ferric hydroxide at 80°. According to Gerock, the reagent contains a sodium salt of ferrisalicylic acid (*Abstr.*, 1900, ii, 769). Alkaline borates are titrated as follows. The sample is dissolved in 25 c.c. of water and mixed with 1 or 2 c.c. of the indicator and dilute hydrochloric acid is added until the colour turns violet; aqueous sodium hydroxide is then added until the colour turns pale orange. Twenty c.c. of glycerol are now added and a few drops of solution of phenolphthalein and the boric acid is then titrated with *N* sodium hydroxide. Calcium borate (boracite) is dissolved in slight excess of hydrochloric acid, the solution diluted with water and any carbon dioxide expelled by boiling in a reflux apparatus; the liquid is then treated as described above.

If the sample should contain aluminium compounds, these may be removed by means of ammonia. The ammonia is then in turn expelled by boiling with excess of aqueous sodium hydroxide. L. DE K.

Detection of Acid Carbonates in Waters. By M. E. Pozzi-Escot (*Ann. Chim. anal. appl.*, 1901, 6, 135—136).—The author revives the proposal made by Jaquemin in 1888 to use his ferroso-

pyrogallol reagent for the detection of acid carbonates in water. Half a gram of pyrogallol is dissolved in 5—6 c.c. of distilled water and 2 drops of the officinal solution of ferric chloride are added. A few drops of this brown reagent are added to 200—250 c.c. of the water to be tested. The smallest traces of acid carbonates produce an amethyst-violet coloration, which deepens gradually to a violet-black. The absence of ammonia must first be assured.

M. J. S.

Estimation of Calcium by the Citrate Method. By MAX PASSON (*Zeit. angew. Chem.*, 1901, 14, 285—286. Compare Abstr., 1900, ii, 246).—When the amount of calcium is very small, it does not always separate properly on the application of the author's citrate process; the method has therefore been slightly modified.

The hydrochloric acid solution of the soil is mixed with dilute ammonia until a slight permanent precipitate is produced, when 25 c.c. of Wagner's citric acid solution (20 grams of citric and 0.1 gram of salicylic acid per litre) are added without delay. When the precipitate has redissolved, which should occupy only a few minutes, another 12—13 c.c. of Wagner's solution are added, the liquid is diluted to 200 c.c. and heated to boiling. Solid ammonium oxalate is now added little by little until no further precipitate is formed, and when the liquid has become clear it is again tested by adding a solution of ammonium oxalate. After standing overnight, the calcium oxalate is collected and treated as usual.

L. DE K.

Estimation of Calcium and Magnesium in Natural Waters. By LUDWIG W. WINKLER (*Zeit. anal. Chem.*, 1901, 40, 82—92).—Clark's soap test can be so modified as to afford an accurate as well as rapid method for estimating both calcium and magnesium in natural waters. If to a solution which contains both metals there be added a small quantity of potassium sodium tartrate with some potassium hydroxide, the soap solution will estimate the calcium only; but if ammonium chloride and ammonia are added, both the calcium and magnesium will consume soap, magnesium requiring one-third more soap than the equivalent quantity of calcium.

The following solutions are required:—1. *Tartrate solution.* One hundred grams of potassium sodium tartrate and 6 grams of potassium hydroxide are dissolved to 500 c.c.

2. *Ammonia solution.* Ten grams of ammonium chloride and 100 c.c. of 10 per cent. ammonia are made up to 500 c.c.

3. *Barium chloride solution.* 4.363 grams of the crystallised salt are dissolved to 1 litre. This solution is of 100° (German) hardness; 10 c.c. of it, diluted to 100 c.c., and mixed with 5 c.c. of solution 1, are used for standardising the soap solution.

4. *Soap solution.* Fifteen grams of pure oleic acid are shaken with 600 c.c. of alcohol (90—95 per cent.), 400 c.c. of water, and 4 grams of potassium hydroxide. The filtered solution is further diluted with alcohol and water until it agrees exactly in strength with solution 3.

To estimate calcium, the water is diluted so far that 100 c.c. will not require more than 10 c.c. of soap solution; that quantity is mixed with 5 c.c. of solution 1, and the hardness estimated in the usual

manner. Since 1.786 grams of calcium carbonate per litre constitutes a solution of 100° (German) hardness, the number of c.c. of soap solution multiplied by 7.143 and corrected for dilution gives the number of mg. of calcium per litre of the original water. To estimate both calcium and magnesium, 100 c.c. of the diluted water are mixed with a further quantity of 100 c.c. of distilled water and 5 c.c. of solution 2. In this titration, it is essential that the lather should persist for at least 5 minutes. The difference between the two titrations, diminished by $\frac{1}{4}$, and multiplied by 4.357 gives mg. of magnesium per litre. Mineral waters containing large amounts of carbon dioxide should be coloured with methyl-orange, neutralised with hydrochloric acid, boiled, cooled, and diluted.

It is noteworthy that the volume of soap solution required is proportional to the hardness, which in Clark's original process is not the case. The presence of free alkali renders the end reaction sharp by preventing the hydrolysis of the potassium oleate. M. J. S.

Solubility of Barium Sulphate in Solutions of Sodium Thiosulphate. By LEONARD DOBBIN (*J. Soc. Chem. Ind.*, 1901, 20, 218—219).—The fact that barium sulphate is markedly soluble in solutions of sodium thiosulphate has been pointed out by Fresenius, and by Salzer (Abstr., 1892, 1514) but appears to be very generally ignored. The addition of dilute nitric acid augments the solubility greatly; hydrochloric acid has a similar, but more feeble action. The author does not fix the limits of solubility, but shows that 0.0142 gram of sodium sulphate in 20 c.c. of *N*/20 thiosulphate mixed with an equal volume of 20 per cent. nitric acid remains perfectly clear with barium chloride. M. J. S.

Estimation of Magnesium by Organic Bases. By W. HERZ and K. DRUCKER (*Zeit. anorg. Chem.*, 1901, 26, 347—349).—The method of estimating zinc by precipitation with an aqueous solution of dimethylamine is applicable to magnesium and gives accurate results (this vol., ii, 240). Magnesium salts are also completely precipitated by a solution of free guanidine; the precipitate of magnesium hydroxide is treated in the usual way. The authors point out that this method is specially advantageous for estimating magnesium in the presence of alkalis, and for the analysis of mixed silicates containing magnesium. E. C. R.

Volumetric Estimation of Mercuric Chloride in Surgical Dressings. By F. UTZ (*Chem. Centr.*, 1901, i, 595; from *Pharm. Centr.*, 1901, 42, 81).—Archetti's method (*Boll. Chim. Farm.*, 39, 765) gives very satisfactory results. Twenty grams of the dressing are digested at 70—80° for several hours with 200 c.c. of a 0.5 per cent. solution of sodium chloride, and the extract is titrated with *N*/10 ammonia and phenolphthalein. The red colour is not obtained until all the mercury is precipitated; 1 c.c. of *N*/10 ammonia = 0.00271 gram of mercuric chloride (compare Abstr., 1900, ii, 762; this vol., ii, 204). M. J. S.

Estimation of Mercury in Official Hydrargyrum Salicylicum. By ERWIN RUPP (*Arch. Pharm.*, 1901, 239, 114—118).—According to the German pharmacopœia (4th ed.), 0.3 gram of this drug should

yield 0.2 gram of mercuric sulphide when it is dissolved in aqueous salt solution, the solution acidified with a little hydrochloric acid, and then precipitated with hydrogen sulphide. This only happens, however, if the precipitation is effected at 100° or thereabouts; a white, gelatinous precipitate is produced first, and in the cold this is not converted into the sulphide. Hydrochloric acid precipitates a substance of the composition $C_7H_5O_3 \cdot HgCl$; in neutral solution, hydrogen sulphide gives a precipitate of the composition $C_7H_5O_3 \cdot Hg \cdot SH$. In both these compounds and in the original salicylate, the mercury is probably attached to the aromatic nucleus (compare Dimroth, *Abstr.*, 1889, i, 54, 528).

The salicylate may also be analysed by pounding it with a little water, allowing it to remain for an hour with 25 c.c. of *N*/10 iodine solution, and titrating the excess of the latter with thiosulphate. Of the commercial product, 0.3 gram requires 16.5—16.8 c.c. of *N*/10 iodine; a sample purified by dissolving it in dilute aqueous sodium hydroxide filtering, and precipitating with acetic acid, required nearly the theoretical amount, 17.85 c.c.

C. F. B.

Detection of Lead in Drinking Waters. By A. BELLOCQ (*J. Pharm.*, 1901, [vi], 13, 56—57).—Water containing even the merest trace of lead presents to the trained eye a decided haze, which disappears on adding nitric acid; the author concludes that the metal exists in combination with an organic substance.

To detect the metal, one or two litres of the suspected water are mixed with 5—10 c.c. of an ammoniacal solution of zinc, and when the supernatant liquid has become perfectly clear, it is carefully decanted and the deposit collected on a small filter. It is then dissolved in warm acetic acid containing a little ammonium acetate, and any lead present is tested for with potassium chromate.

L. DE K.

Estimation of Aluminium in Steel. By E. SPATZ (*Zeit. öffentl. Chem.*, 1901, 7, 60—62).—About 1 gram of aluminium-steel is dissolved in a platinum dish in a mixture of 20 c.c. of water and 2 c.c. of sulphuric acid; during the heating on the water-bath, the dish is covered with another platinum dish. When the steel is dissolved, the liquid is rinsed into a platinum or silver dish holding 400 c.c.; 40 grams of ammonium oxalate are added, and the liquid is submitted to electrolysis until only traces of iron are left in solution. The liquid is then siphoned off and evaporated to dryness in a platinum dish; the residue is ignited, and fused with a known weight of potassium hydrogen sulphate. The fused mass is dissolved in water and a few drops of sulphuric acid mixed with a few drops of a solution of ammonium phosphate, and then with excess of dilute ammonia; the precipitate is purified by dissolving it off the filter in warm dilute hydrochloric acid and reprecipitating with ammonia, when it is washed, dried, ignited, and weighed as aluminium phosphate + ferric phosphate. The precipitate is again fused with a known weight of potassium hydrogen sulphate; the fused mass is dissolved in dilute sulphuric acid, and the iron reduced to the ferrous state by means of a known weight of zinc; it is then titrated with permanganate. A blank experiment is made, using exactly the same

quantities of the various reagents, and any aluminium found is allowed for.

L. DE K.

Chemical Analysis of Soils. By B. SJOLLEMA (*Chem. Zeit.*, 1901, 25, 311—312).—A criticism of Dyer's method (*Trans.*, 1894, 65, 115). The phosphates soluble in a 1 per cent. solution of citric acid are not properly extracted unless the sample is treated repeatedly with fresh quantities of the solvent.

L. DE K.

Analysis of Soils. By J. ALAN MURRAY (*Analyst*, 1901, 26, 92—96).—A criticism of the method proposed by Hall and others (this vol., ii, 80). The author thinks that the constituents should be reported in ounces per cubic foot, which is practically the same as grams per cubic decimetre. The scheme should also include a determination of organic carbon, from which the amount of humus may then be calculated, as this contains an average of 50 per cent. of carbon. In one case, it was found that a considerably larger proportion of available phosphoric acid was obtained by extracting the undried sample. It is also pointed out that the stones contained in the soil should also be tested to ascertain whether they yield any available plant food.

L. DE K.

The Detection and Estimation of Minute Quantities of Manganese. By HUGH MARSHALL (*Chem. News*, 1901, 83, 76).—Oxidation by means of a persulphate is accelerated by the addition of silver nitrate. Minute quantities of manganese may be detected by gently warming the solution with potassium or ammonium persulphate, a moderate quantity of sulphuric or nitric acid, and a drop of silver nitrate solution; a distinct permanganate coloration is obtained in half a c.c. of solution containing 0.001 mg. of manganese. By taking known quantities and comparing with standard permanganate solutions, the method may be used quantitatively.

D. A. L.

Estimation of Iron in Human Urine. By PAUL HOFFMANN (*Zeit. anal. Chem.*, 1901, 40, 73—82).—See this vol., ii, 326.

Separation of Ferric Chloride in Aqueous Hydrochloric Acid from other Metallic Chlorides by Ether. By FRANK L. SPELLER (*Chem. News*, 1901, 83, 124—125).—Ether removes ferric chloride from its solution in hydrochloric acid whilst other chlorides are mostly insoluble, and Rothe based a method for the separation of iron on this property. The author now shows that the separation is most effective with hydrochloric acid ranging in sp. gr. from 1.100 to 1.115 used in small quantity. In analytical work, the solution of the mixed chlorides is treated with nitric acid, evaporated to a syrupy condition, dissolved in as small a quantity of hydrochloric acid of sp. gr. 1.105 as possible, and extracted with ether in a separating funnel, using 5 c.c. of ether for every decigram of iron present; a second treatment with ether or a single precipitation with ammonia removes any iron remaining in the aqueous solution.

D. A. L.

The Assay of Gold Sodium Chloride. By JOHNSON and SONS (*J. Soc. Chem. Ind.*, 1901, 20, 210).—Fifteen grains of the substance are dissolved in an ounce of water, the gold is precipitated by sul-

plurous acid, collected on a filter, dried, ignited, and weighed. The error of the assay is ascertained by dissolving 7 grains of pure gold in aqua regia, evaporating, redissolving, and reducing in exactly the same manner, and the corresponding correction is made in the result.
M. J. S.

Estimation of Organic Carbon in Water. By JOSEF KÖNIG (*Zeit. Nahr. Genussm.*, 1901, 4, 193—201).—Five hundred c.c. of the sample are filtered through asbestos contained in a Gooch crucible. The filtrate is mixed with 10 c.c. of dilute sulphuric acid and boiled for half an hour to expel carbon dioxide in a round bottomed flask furnished with a dropping funnel to which a soda-lime tube is attached, and with a specially constructed condensing tube. Two or three grams of potassium permanganate, 10 c.c. of a 20 per cent. solution of mercuric sulphate and another 40 c.c. of dilute sulphuric acid are added, and the boiling is continued after connecting the condensing tube with a Peligot tube containing a little sulphuric acid, and a U-tube containing calcium chloride to absorb any moisture; the carbon dioxide resulting from the oxidation of the carbon is then absorbed in two weighed soda-lime tubes connected with a guard tube filled partly with soda-lime and calcium chloride.

The carbon in the suspended matter may also be estimated in this apparatus, using a 250 c.c. boiling flask, by heating the asbestos with 10 c.c. of mercuric sulphate solution, 10 c.c. of a 50 per cent. solution of chromic acid, and 50 c.c. of strong sulphuric acid.

If the sample is suspected of containing volatile carbon compounds, it is at once oxidised with sulphuric acid, mercuric sulphate, and potassium permanganate, allowance being made for the carbon dioxide in the water.
L. DE K.

Source of Error in the Permanganate (Kubel-Tiemann) Process for Estimating Organic Matter in Potable Water. By MAURICE DUYK (*Ann. Chim. anal. appl.*, 1901, 6, 121—126).—The author, who employs that modification of the permanganate process which consists in boiling the water with permanganate and sulphuric acid, calls attention to the large errors caused by the presence of chlorides (compare Abstr., 1886, 581; this vol., ii, 201). The error may be completely obviated by shaking the water for an hour or two with enough moist silver oxide to remove all the chlorine.
M. J. S.

Microchemical Distinction of the Hydrocarbons of Coal Tar. By THEODOR H. BEHRENS (*Rec. Trav. Chim.*, 1900, 19, 386—397).—I. *Solid Hydrocarbons*.—The reagent used is *a*-dinitrophenanthraquinone. This gives *rhombs* with naphthalene, acenaphthene, indole, anthracene, and carbazole. *Yellow rhombs*, naphthalene, confirmed by the formation of small, red rhombs with chrysamic acid. *Brown rhombs*, indole, confirmed by giving with chloranil chocolate prisms showing a dichroism into black. *Orange rhombs*, acenaphthene, giving with chrysamic acid bluish-green needles, showing a dichroism into blue. *Grey rhombs*, with dichroism into blue, anthracene; confirmed by giving green needles with chrysamic acid and by

yielding on oxidation with chromic acid in glacial acetic acid solution anthraquinone, crystals of which from nitrobenzene show an axial extinction in polarised light. *Violet rhombs*, carbazole, which gives green needles with chrysamic acid and is destroyed by chromic acid.

Brown prisms are formed by α -dinitrophenanthraquinone with fluorene and phenanthrene. The former volatilises with naphthalene in a current of steam, and the product of oxidation by chromic acid is not a quinone; the latter sublimes with anthracene, and yields a yellow ortho-quinone on oxidation, characterised by uniting with *o*-phenylenediamine to form yellow crystals of the phenazine which are coloured red by concentrated hydrochloric acid, and by yielding with carbazole in nitrobenzene solution copper-coloured rhombs of an additive product.

Red needles are formed by α -dinitrophenanthraquinone with chrysene, which sublimes *after* anthracene. *Brownish-red rods* (tiges) are formed with difficulty by pyrene, which gives small rod-like greenish-black crystals with chrysamic acid, sublimes with chrysene, from which it can be separated by alcohol, and yields on oxidation a red para-quinone.

II. *Liquid Hydrocarbons*.—These are nitrated and the nitro-compounds reduced by means of ammonium sulphide to bases which are characterised by the action of a solution of iodine in potassium iodide on their hydrochlorides in presence of sulphuric acid (acid solution) or of potassium sulphate (neutral solution).

A. The neutral or acid solutions give red or brown sulphates; aniline (dichroic), *o*-, *m*-, and *p*-toluidine (non-dichroic).

B. Neutral solutions give reddish sulphates; acid solutions, grey, dichroic hydriodides; *v-o*-xylidine, *p*-xylidine, *s-ψ*-cumidine.

C. Neutral and acid solutions yield only a grey hydriodide: *a-m*-xylidine.

Illustrations are given of the forms of the principal crystalline derivatives referred to of the solid constituents of coal tar.

W. A. D.

Comparative Method for Determining the Fusing Points of Asphalts. By CHARLES F. MABERY and OTTO J. SIEPLEIN (*J. Amer. Chem. Soc.*, 1901, 23, 16—20).—In a glycerol-bath is placed a narrow beaker closed by a cork, through which is passed a thermometer and a strip of metal; the lower end of the strip is bent at right angles, the corners are turned up, and the section of asphalt, large enough to project on either side of the metal, is pressed on the points so formed. The temperature is noted at which the specimen becomes sufficiently fluid to fall on either side of the metal support and just touch the bottom of the beaker. In order to obtain comparable results, the distance of the thermometer from the specimen, the distance of the metal from the bottom of the beaker, the width of the metal strip, and the dimensions of the specimen must be kept constant.

E. G.

Rapid Method for the Determination of Prussian Blue in Spent Oxide. By JAS. M. POPPLEWELL (*J. Soc. Chem. Ind.*, 1901, 20, 225).—Five grams of the substance are boiled for 5 minutes with

50 c.c. of a 5 per cent. solution of sodium hydroxide. The filtered extract and washings are precipitated hot with excess of ferric chloride and hydrochloric acid. The precipitate is collected on a filter, washed, and then treated in the cold with a similar quantity of sodium hydroxide for 10 minutes. The solution so obtained is acidified with sulphuric acid and titrated with a solution of copper sulphate (12.48 grams per litre) until a drop on filter paper gives no blue colour with a contiguous spot of ferric chloride. M. J. S.

Detection of Methyl Alcohol in Vinegar. By R. ROBINE (*Ann. Chim. anal. appl.*, 1901, 6, 127—129).—Although it is commonly believed that *Mycoderma aceti* cannot develop in methyl alcohol, it is nevertheless possible to employ a certain proportion of methylated spirit in the manufacture of vinegar. Since the methyl alcohol escapes oxidation, its detection in the vinegar by Trillat's process (Abstr., 1889, ii, 130; 1900, ii, 111) serves for the discovery of this fraud. A litre of the vinegar is distilled through a Le Bel fractionating tube. The first 400 c.c. are made alkaline, 100 c.c. are distilled off and oxidised by 5 grams of potassium dichromate and 20 c.c. of sulphuric acid (1:5). After an hour, the liquid is distilled. The first 2—3 c.c. which contain acetaldehyde are rejected, and the following 50 c.c. are heated with pure dimethylamine in a corked flask for $2\frac{1}{2}$ hours. The mixture is then made alkaline and the excess of dimethylamine distilled off. If the contents of the flask are then yellow, or turbid, the acetaldehyde has been imperfectly expelled, and the whole operation must be repeated. If colourless, acetic acid and lead dioxide are added, and the mixture boiled. The production of a pure blue colour (which disappears on cooling) is conclusive as to the presence of methyl alcohol, but a dubious greenish-blue coloration may be obtained if the acetaldehyde has not been completely removed. M. J. S.

Dilution of Wine and its Detection. By ARMAND GAUTIER, ALLYRE CHASSEVANT and LOUIS MAGNIER DE LA SOURCE (*J. Pharm.*, 1901, [vi], 13, 14—18).—As the result of six analyses of wines which were poor but not diluted with water, and also having regard to the fact that the volatile acidity may increase by storage, the authors now propose the following rule for determining whether a sample has probably been watered.

The fixed and the volatile acidity are each taken separately and calculated as sulphuric acid per litre. If the volatile acidity exceeds 1, the unit is added to the fixed acidity; the sum represents the joint acidity before souring. The excess of volatile acidity is divided by 10 and added to the alcoholic titre (percentage of alcohol by volume). In a sample which has not been diluted, the sum of the alcoholic titre and joint acidity per litre should not be less than 12.5. L. DE K.

Wine Analysis. Modification of the "Sum of Alcohol-Acid Rule." By FERDINAND JEAN (*Rev. Intern. Falsif.*, 1901, 14, 18—19).—The author approves of the modification proposed by Gautier, Chassevant, and Magnier de la Source (preceding abstract). L. DE K.

Volumetric Estimation of Phenol. By JAMES F. TOCHER (*Pharm. J.*, 1901, [iv], 12, 360—361).—The estimation of phenol in

aqueous solutions may be effected by the following process. The solution is rendered alkaline with sodium hydrogen carbonate, excess of decinormal potassium permanganate added, the liquid boiled for 5 minutes, allowed to cool, and then acidified with sulphuric acid; the mixture is now warmed to 60° and titrated with decinormal oxalic acid. It is found that 29.78 c.c. of the permanganate solution are required for 0.01 gram of phenol, in accordance with the equation $C_6H_5 \cdot OH + 7O_2 = 6CO_2 + 3H_2O$. E. G.

A Simple Fermentation Saccharimeter. By PAUL HAMBERGER (*Chem. Centr.*, i, 718; from *Pharm. Zeit.*, 46, 174).—A wide-necked bottle of 25 c.c. capacity, is provided with a caoutchouc stopper, through which passes a straight glass tube, 30 cm. in length and 6 mm. diameter, which is graduated from the upper end into 20 portions of 0.29 c.c. each. In the bottle are placed 100 grams of mercury, 10 c.c. of the sugar solution, containing about 0.1 gram of sugar, a sufficient quantity of yeast, and water up to the neck. The stopper is then inserted, with the tube dipping into the mercury, but avoiding the entrance of the aqueous liquid into the tube. By forcing in the stopper, the mercury is driven up the tube until its level can be noted. The bottle is then plunged for 2 hours into water of $34-36^{\circ}$. According to the author's experiments, 0.1 gram of sugar will in that time furnish a quantity of carbon dioxide, which, together with the expansion of the liquids, will raise the level of the mercury in the tube through 10 divisions. M. J. S.

A New Sugar Reaction. By OFFER (*Chem. Centr.*, 1901, i, 646; from *Med. Woch.*, 1901, 81).—Five c.c. of urine are heated to boiling with a small quantity of phenylhydrazinesulphonic acid and then mixed with 10 c.c. of 15 per cent. sodium hydroxide solution. After cooling and shaking, a rose-red coloration is produced if more than 0.1 per cent. of sugar is present. A similar reaction is obtained with naphthylhydrazinesulphonic acid, also with phenylhydrazine salicylate or acetate. M. J. S.

Estimation of Reducing Sugars in Blood. By G. MEILLÈRE and P. CHAPPELLE (*J. Pharm.*, 1901, [vi], 13, 257—262).—A measured quantity of blood (20—30 c.c.) is heated to boiling as soon as possible after being drawn, to arrest the action of ferments. The clots are crushed, and there are added 1 drop of acetic acid, 5 c.c. of a saturated solution of zinc acetate, and 10 grams of sodium sulphate. The mixture is again boiled, and the liquid extracted from the clot either by a centrifugal machine or by a press and subsequent filtration. When completely clarified, it is divided between two tubes, which are plunged into boiling water. In each are dissolved 2.5 grams of a mixture of 10 parts of tartaric acid and 7 parts of copper sulphate, and then 8 c.c. of potassium hydroxide solution (containing 1 gram per c.c.). After 15 minutes, the cuprous oxide is separated, washed by centrifuging, and weighed after drying at 120° . It should be calculated into dextrose, the factor being ascertained by comparative experiments made under identical conditions, but inasmuch as several carbohydrates

may be present, much information may be gained from estimations made before and after hydrolysis, and after fermentation with yeast.

M. J. S.

Estimation of Sugar in Urine by Lehmann's Method. By O. GOETZEL-ALBERS (*Chem. Centr.*, 1901, i, 706; from *Pharm. Zeit.*, 46, 156).—In processes of sugar estimation by Fehling's solution which depend on the amount of unreduced copper being ascertained, it is sometimes necessary, after reduction, to clarify the solution by filtration through paper. Since paper retains copper, it is, in that case, essential that the standard should consist of Fehling's solution, appropriately diluted, filtered through a paper of the same size.

M. J. S.

Estimation of Sugar in certain Urines. By GUSTAVE PATEIN (*J. Pharm.*, 1901, [vi], 13, 176—177).—The author has met with a urine containing methylene-blue in sufficient quantity to communicate a green colour to the sample. On adding basic lead acetate, the yellow colouring matter of the urine was precipitated, leaving a filtrate of a decided bluish colour unfit to be examined for sugar in the usual way. The colouring matter was, however, completely removed on adding mercuric nitrate.

L. DE K.

Estimation of Sugar in Vinous Products. By A. BERNARD (*Ann. Chim. anal. appl.*, 1901, 6, 89—95).—Ten c.c. of grape juice, or similar liquid suitably diluted, are mixed in a conical flask with 20 c.c. of Fehling's solution and rapidly heated to boiling. In order to prevent any sensible loss by evaporation, the flask is then at once cooled by placing it in water. When cold, the liquid is filtered and 15 c.c. (or more) of the filtrate are titrated with solution of potassium cyanide until colourless. The cyanide solution is conveniently made of such a strength that 10 c.c. are just sufficient to decolorise 10 c.c. of Fehling's solution. The exact strength of the latter may be ascertained by means of an accurately made solution of invert sugar.

L. DE K.

Estimation of Sucrose and Lactose in Condensed Milk. By SEVERIN H. R. RIIBER and C. N. RIIBER (*Zeit. anal. Chem.*, 1901, 40, 97—110).—The method worked out by Kjeldahl for the estimation of two sugars simultaneously present in a solution (*Abstr.*, 1896, ii, 580), appears to be based on the postulate that the amount of copper yielded by one of the sugars bears the same proportion to the amount of that sugar present as the total copper obtained would bear to the amount of the same sugar which would be necessary to produce the total reduction observed. This is only absolutely correct when the two sugars reduce Fehling's solution with equal rapidity, but when it is applied to a mixture of invert sugar and lactose, the former of which reduces much more rapidly than the latter, an inaccuracy appears in consequence of the invert sugar acting chiefly on a strong copper solution, and the lactose on a relatively enfeebled one. The error can, however, be avoided by the following device. From a pair of titrations (one before and the other after inversion) an approximate result is calculated. Expressing the percentage of sucrose found as $K.R$, in which

R is the true percentage, the value of K may be ascertained within the limits of experimental error by preparing a solution of pure sucrose and lactose, having the composition indicated by the approximate result, and titrating this in exactly the same manner. The practical method of procedure is as follows. Ten grams of the condensed milk are mixed with 400 c.c. of water in a 500 c.c. flask. The casein and fat are precipitated by adding 10 c.c. of copper sulphate (69.278 grams per litre), followed by 10 c.c. of sodium hydroxide (10.2 grams per litre). After making up and filtering, 50 c.c. of the filtrate are titrated by Kjeldahl's process (*loc. cit.*). This gives the approximate percentage of lactose, $K.L$. Fifty c.c. are then inverted by mixing with 10 c.c. of $N/5$ hydrochloric acid, and plunging for exactly 30 minutes into boiling water; the acid is neutralised by 10 c.c. of $N/5$ sodium hydroxide, the liquid cooled and made up to 100 c.c., of which 25 c.c. are titrated in exactly the same manner. Taking from Kjeldahl's table the amount of lactose which would reduce the total amount of copper found in the second titration, the proportional weight of copper resulting from the lactose found in the first titration is calculated. The difference is the copper reduced by the invert sugar, and the amount of invert sugar which has produced it is proportional to the amount (read from the table) which would have yielded the total copper found. Multiplying by 0.95 to convert invert sugar into sucrose, the value of $K.R$ is obtained. A solution is now prepared containing $K.L$ per cent. of lactose, and $K.R$ per cent. of sucrose, and by a precisely similar pair of titrations and a calculation made in the same manner, the value of K is obtained. Since the error in the percentage of lactose is nearly proportional to the amount of sucrose present, it is best to put $L = KL - K'R$. Then from the titrations with known weights of the pure sugars (L' and R'), there is obtained an equation from which the value of K' is found, and thence the true percentage of lactose (L).

If the object is to ascertain the percentage of refined cane sugar in the condensed milk, instead of that of pure sucrose, a similar method of analysis must be employed to find the percentage of sucrose in the refined sugar.

An example will render the method of calculation clearer. A sample of milk gave $K.R = 41.43$ per cent., and $K.L = 14.99$ per cent. A solution made up with 4.15 grams of sucrose and 1.5 grams of lactose in 500 c.c. showed, on analysis, 4.072 grams of sucrose and 1.609 grams of lactose, whence $K = 0.9813$, and $K' = 0.0263$ ($4.15 K' = 1.609 - 1.5$), and the true values for the milk were $R = 42.22$ per cent., and $L = 13.88$ per cent. ($14.99 - 0.0263 \times 42.22$).

The method applied to three samples of milk prepared with known amounts of sucrose gave extremely close results. M. J. S.

The so-called Furfuraldehyde Tests for Carbohydrates. By CARL NEUBERG (*Zeit. Ver. deut. Zuckerind.*, 1901, 270—279).—A number of sugars and sugar-like compounds have been submitted to the following carbohydrate tests: (1) the α -naphthol test of Molisch (*Abstr.*, 1886, 923), and von Udránsky (*Abstr.*, 1888, 878); (2) Seliwanoff's resorcinol test (*Abstr.*, 1887, 459); (3) Tollen's phloroglucinol test (*Abstr.*, 1889, 847; 1896, ii, 504), and (4) the orcinol

test (see Tollens, *Annalen*, 1890, 260, 304). The following table contains a *résumé* of the results obtained, the sign + or - indicating that the compound does or does not answer to the test concerned :

	α -Naphthol.	Resor- cinol.	Phloro- glucinol.	Orcinol.
Glycolaldehyde	+	-	-	-
Glyceraldehyde.....	+	-	+	(weak) +
Glycerose { (a) prepared with NaOBr	+	+	-	+
(b) from lead glycerate...	+	+	+	(weak) +
<i>l</i> -Erythrose	+	-	+	(weak) -
<i>i</i> -Tetrose	+	+	+	(weak) -
<i>d</i> -Lyxose	+	-	+	+
<i>d</i> -Arabinose.....	+	-	+	+
<i>r</i> -Arabinose	+	-	+	+
<i>l</i> -Keto-arabinose	?	+	?	?
<i>i</i> -Keto-galactose	?	+	-	-
<i>d</i> -Oxygluconic acid	+	+	+	+
Aldehydomucic acid	+	-	+	+
Formose	+	+	+	+

T. H. P.

Estimation of Carbohydrates in Human Fæces. By JOSEF STRASBURGER (*Pflüger's Archiv*, 1901, 84, 173—190).—The estimation of carbohydrates in fæces is a new field, and the whole of the present paper is occupied with a description of methods, several of which were tested, for the estimation of sugar and starch. The Volhard-Pflüger method for sugar gave the best results, although there was always some loss. Starch, even in small quantity, can also be estimated with certainty. Results are promised in a future paper. W. D. H.

Titration of Salicylic Acid, Salicylates, and Phenol. By FERNAND TELLE (*J. Pharm.*, 1901, [vi], 13, 49—56).—The process is based on the fact that a solution of sodium hypochlorite added to a solution of potassium bromide acidified with hydrochloric acid liberates bromine. If the solution contains salicylic acid or phenol, no bromine will be set free until the former has been converted into the dibromo- and the latter into the tribromo-compound. The hypochlorite is prepared by diluting 35 c.c. of the commercial product to a litre, and its exact bromine liberating power is found by titrating it with potassium bromide and a known weight of arsenious acid.

Salicylic Acid.—One gram of the sample is dissolved in 2 c.c. of aqueous sodium hydroxide of sp. gr. 1.2 and 50 c.c. of water, and diluted to 500 c.c. Twenty-five c.c. (0.05 gram of the sample) are then mixed in an Erlenmeyer flask with 5 c.c. of a 10 per cent. solution of potassium bromide and 10—15 drops of hydrochloric acid, and the hydrochlorite is added from a burette until the precipitation is almost complete. Five c.c. of chloroform and a little alcohol are now added to dissolve the precipitate, and the addition of hypochlorite is continued until the chloroform turns yellowish from the presence of free bromine.

Sodium, Lithium, and Magnesium Salicylates.—These are titrated like the free acid ; there is no need for dissolving in aqueous sodium hydr-

oxide. *Bismuth salicylate*. One gram is boiled with 25—30 c.c. of water and 3 c.c. of aqueous sodium hydroxide for 10 minutes. When cold, the liquid is diluted to 250 c.c. and 25 c.c. are taken for the titration. *Phenol*. One gram is dissolved in a litre of water and 25 c.c. are titrated as before; it is not necessary to use chloroform, the end reaction being shown by the liquid becoming faintly yellow. *Salol* (*phenyl salicylate*). 0.25 gram of the sample is boiled with 2 c.c. of aqueous sodium hydroxide, and 20 c.c. of water for some minutes to hydrolyse the compound; when cold, the liquid is diluted to 100 c.c., and 10 c.c. are used for the titration. One mol. of salol requires 10 atoms of bromine.

L. DE K.

Estimation of Hippuric Acid. By WILLIAM ARTHUR CATES (*Chem. News*, 1901, 83, 121).—In using Bunge and Schmeideberg's method for the estimation of hippuric acid, after the washing with alcohol, ethyl acetate, and petroleum, the crystals may advantageously be dissolved in hot water and titrated with *N*/10 sodium hydroxide, using phenolphthalein as indicator; the results are not vitiated by pigmentary matter, and hence are probably more accurate than those obtained gravimetrically.

D. A. L.

Rapid Estimation of Fatty Acids in Soaps. By ACHILLE BAUD (*Ann. Chim. anal. appl.*, 1901, 6, 83—84).—Ten c.c. of the solution of the soap are heated in a graduated tube, having a bulb at the centre and another one at the bottom, with 10 c.c. of hydrochloric acid until the fatty acids are completely liberated. When cold, 35 c.c. of ether are added, the tube is corked and well shaken. When the two layers have completely separated, the volume of the ethereal layer is read off and a definite volume is removed by means of a pipette; the fatty acids are then obtained by evaporating the ether.

L. DE K.

Mean Molecular Weight of the Fixed (Insoluble) Acids of Fats. By MASSIMO TORTELLI and A. PERGAMI (*L'Orosi*, 1901, 24, 1—11).—The authors call attention to the error of the generally accepted view that the index of saponification of a mixture of fatty acids obtained from a fat or oil is identical with the index of acidity. The values of these two quantities have been determined for a large number of mixtures of fatty acids yielded by different fats and oils of various ages, as well as for so-called pure samples of the acids contained in these substances. In nearly all cases differences appear, and on calculating the mean molecular weights of the mixed fatty acids from the two indices, it is found that the number yielded by the saponification index is always less than that given by the index of acidity; the value of the latter often points to a mean molecular weight greater than those of all the component acids of the mixture. It is concluded that the differences thus observed are due to the presence in oils and fats of anhydrides or lactones in a proportion varying with the nature and age of the product. The true mean molecular weight of the fixed fatty acids must hence be deduced from their saponification number determined in the same way as with fats, that is, by hydrolysing with an excess of hot potassium hydroxide, the amount of the excess being

afterwards estimated by titration with a standard mineral acid. Since the proportion of anhydrides or lactones in a fat increases in general with the age of the fat and with the changes which it undergoes, a comparison of the acidity and saponification numbers is useful as an indication of the state of preservation and the freshness of the fat; the better the quality of the latter, the smaller is the difference between the two numbers. That the lactones occurring in oils are not present entirely in the free state, but partly as glycerides, is shown by comparing the oil as found naturally with the same oil after it has been neutralised to remove free fatty acids and washed with absolute alcohol to get rid of lactones in the free state; the proportion of lactones in the oil, as deduced from the difference between the saponification and acidity numbers, is found to be almost exactly the same before and after such treatment. T. H. P.

Use of Amyl Alcohol in the Analysis of Fats. By GEORGES HALPHEN (*Ann. Chim. anal. appl.*, 1901, 6, 133—135).—Referring to the proposal of Eichhorn (this vol., ii, 48), the author reproduces his note in the *Revue Phys. Chim.*, 1899, 295, and claims priority for the use of amyl alcohol for the estimation of free fatty acids in neutral fats. The substance is dissolved in 4—5 vols. of amyl alcohol and the titration made with a solution of sodium hydroxide in 90—95 per cent. alcohol, using phenolphthalein as indicator. The red coloration which indicates the end of the neutralisation is very transient, owing to the rapidity with which saponification commences.

The following method for estimating non-saponifiable substances in fats is rapid, and sufficiently accurate for commercial purposes. Five to ten grams of the fat are dissolved in 10 vols. of carbon disulphide; concentrated sulphuric acid (twice as much as the fat taken) is added drop by drop, with shaking, avoiding rise of temperature; the whole is rinsed into a separating bulb, the lower layer run out, and the upper one shaken with a little animal charcoal to remove tar and traces of acid. It is then filtered, distilled, and the residue weighed.

M. J. S.

Estimation of Fat in Blood. By M. BÖNNINGER (*Chem. Centr.*, 1901, i, 583—584; from *Zeit.klin. Med.*, 42, 65—71) See this vol., ii, 325.

Estimation of Fat in Cream. By V. DEHLHOLM (*Exper. Stat. Record*, 1900, 11, 812; from *Milkeritid*, 1899, 12, 313—319).—The fat is estimated by the Gerber method after diluting the cream with water until the percentage of fat is reduced to about 6—8. The results are slightly low and are corrected by means of a table given in the original papers. The production of froth may be avoided by heating the undiluted cream for 5 minutes at 69°.

N. H. J. M.

Estimation of Fat in Milk by means of Anhydrous Sodium Sulphate. By OCTAVE LE COMTE (*J. Pharm.*, 1901, [vi], 13, 58—60).—Twenty grams of anhydrous sodium sulphate are introduced into a mortar, finely powdered and mixed with 10 c.c. of the milk to be tested: if the latter is sour, 1 gram of calcium carbonate is added. After an hour, the sodium sulphate will have completely absorbed the water from the milk, leaving a dry mass which, after being reduced to

a fine powder, is introduced into a tube closed with a plug of cotton wool and extracted with ether.

L. DE K.

Nature and Properties of Corn Oil [Maize Oil]. II. Determination of the Constitution. By HERMANN T. VULTÉ and HARRIET WINFIELD GIBSON (*J. Amer. Chem. Soc.*, 1901, 23, 1—8. Compare Abstr., 1900, ii, 697).—Maize oil contains 1.41 per cent. of phytosterol and 1.11 per cent. of lecithin. In addition to the fatty acids detected by previous workers, the authors have identified hypogaecic, arachidic and acetic acids, and have also confirmed the presence of formic acid.

E. G.

Estimation of Unsaponifiable Matters in Commercial Oleins. By PAUL NEFF (*Zeit. angew. Chem.*, 1901, 14, 309—311).—Ten grams of the sample are dissolved in 75 c.c. of 95 per cent. alcohol, 5 grams of potassium hydroxide dissolved in a very little water are added, and the whole is boiled in a reflux apparatus for three-quarters of an hour. The hot liquid is diluted with 50 c.c. of water and transferred to a separating funnel, a few drops of phenolphthalein are added, and the solution nearly neutralised with dilute hydrochloric acid. To the cold liquid are now added 50 c.c. of light petroleum (b. p. not exceeding 80°), and the whole is thoroughly shaken. After a few minutes, the aqueous portion is drawn off, and 25 c.c. of the light petroleum (= 5 grams of sample) are pipetted off and evaporated in a weighed beaker. The residue is dried at 110° and weighed.

The soap solution dissolves a quantity of light petroleum amounting to 9 or 10 c.c., but it appears that it also dissolves a corresponding proportion of unsaponifiable matter; at all events, the results obtained are perfectly trustworthy as shown by a dozen test experiments.

L. DE K.

Detection of Sesamé Oil in Vegetable and Animal Oils. By TAMBON (*J. Pharm.*, 1901, [vi], 13, 57—58).—The reagent consists of a solution of 3 or 4 grams of pure dextrose in 100 c.c. of hydrochloric acid; this solution keeps for a long time without blackening. Fifteen c.c. of the suspected oil are shaken in a glass-stoppered test-tube with 7 or 8 c.c. of the reagent for 2 or 3 minutes, then just heated to boiling and again well shaken. In the presence of 1—5 per cent. of sesamé oil, the liquid after a few minutes assumes a fine rose colour with a violet reflex rapidly turning to a permanent cherry-red. If as much as 10 per cent. is present, the colour appears almost instantaneously.

L. DE K.

Gasometric Estimation of Formaldehyde. By E. RIEGLER (*Zeit. anal. Chem.*, 1901, 40, 92—94).—When hydrazine sulphate is mixed with iodic acid, the whole of the nitrogen is almost instantly liberated. Formaldehydrazone is, however, decomposed much more slowly, so that the amount of formaldehyde which has been added to an excess of hydrazine sulphate can be calculated from the deficiency in the amount of nitrogen liberated by iodic acid, if the measurement is made with sufficient rapidity. The solutions used contain 1 gram of

hydrazine sulphate in 100 c.c., and 5 grams of iodic acid in 50 c.c. of water. The Knop-Wagner azotometer may be used: 20 c.c. of the hydrazine sulphate solution, diluted to 40 c.c., are placed in the outer reaction vessel and 5 c.c. of the iodic acid in the inner tube. After equalising the temperature, the reaction flask is shaken for half a minute, then placed for 2 minutes in the cooling cylinder and the volume of gas noted. A similar quantity of the hydrazine solution is then mixed in a flask with a measured quantity of the formaldehyde solution, containing not more than 0.08 gram of formaldehyde. After a quarter of an hour the mixture is rinsed into the decomposition vessel, and made up to 40 c.c. with the rinsings. The decomposition is performed as before, care being taken that the times specified are not exceeded. One c.c. of nitrogen (at 0° and 760 mm.) = 2.7 mg. of formaldehyde.
M. J. S.

Gasometric Estimation of Acetone in Urine. By E. RIEGLER (*Zeit. anal. Chem.*, 1901, 40, 94—97).—Boiling Fehling's solution oxidises phenylhydrazine with evolution of the whole of its nitrogen in the elementary state (Abstr., 1892, 1322), whilst it has no such action on acetonehydrazone, and this fact has been applied by Jolles to the estimation of acetone. The author simplifies Jolles' process. An alkaline copper solution at the ordinary temperature can be substituted for the boiling Fehling's solution. The solutions used are: (A), 1 gram of phenylhydrazine hydrochloride in 50 c.c. of water; if turbid, the solution should be filtered. (B), Fifteen grams of copper sulphate in 100 c.c. (C), Fifteen grams of sodium hydroxide in 100 c.c.

Fifty c.c. of the urine are mixed with 1 c.c. of glacial acetic acid and distilled into a flask containing 10 c.c. of solution A and 1 gram of crystallised sodium acetate. When 40—45 c.c. have distilled over, the flask is heated for a quarter of an hour on the water-bath, cooled, and its contents rinsed into the evolution flask of a Knop-Wagner azotometer, where they are mixed with 10 c.c. of solution C. In the inner tube are placed 10 c.c. of solution B. After shaking for half a minute and cooling for 5 minutes, the volume of gas can be read off. A similar experiment is made without the acetone, and the difference between the gas volumes (in c.c. at 0° and 760 mm.) multiplied by 2.6 gives mg. of acetone.
M. J. S.

Estimation of Camphor in Camphor Oil. By H. LÖHR (*Chem. Zeit.*, 1901, 25, 292).—The author's process is a purely technical one. The camphor oil is exposed to a low temperature, the camphor is pressed out, and the oil submitted to fractional distillation. The fraction passing over between 195° and 220° is again frozen to recover any camphor it may contain, and the process is then repeated until no more camphor is obtained. With care, the results are almost quantitatively correct.

L. DE K.

Separation and Estimation of Ammonia and Methylamines. By HENRI QUANTIN (*Ann. Chim. anal. appl.*, 1901, 6, 125—126; see Abstr., 1893, ii, 104).—The only new feature in the present paper is the proposal to add a known quantity of methylamine, if the amount

already present is insufficient to maintain the alkalinity of the liquid, during the precipitation of the ammonia as ammonium magnesium phosphate. Methylamine, free from ammonia, may be obtained by distilling a crude methylamine salt with lime into water containing excess of magnesium phosphate. The ammonium magnesium salt, in which the ammonia is to be estimated, must be dissolved in hydrochloric acid before adding soda.

M. J. S.

A Simple Ureometer. By FERNAND GIRARDET (*Bull. Soc. Chim.*, 1901, [iii], 25, 329—334).—The apparatus described consists essentially of a vertical tube, connected above with the vessel in which the nitrogen is evolved, which is fixed in the axis of a wider tube, provided at its lower end with a pinchcock and jet. At the commencement of an experiment, the apparatus is nearly filled with water, so as to stand at the same level in the two tubes; the gas is generated in the usual manner with hypobromite, and water is then run out from the wider tube until the level is again equalised. The volume or weight of the water thus collected bears a constant proportion, which is determined once for all, to the volume of nitrogen evolved. The exact proportion depends on the relative diameters of the tubes used; in the apparatus employed by the author it is as 5 to 1. The advantages claimed are ease of construction and great accuracy, without the necessity of graduations.

N. L.

Estimation of the Amount of Alkaloids in Cinchona Barks. By B. A. VAN KETEL (*Zeit. angew. Chem.*, 1901, 14, 313—315).—Four grams of the cinchona powder are mixed in a mortar with 2 grams of calcium hydroxide, then moistened with 5 c.c. of ammonia, and boiled in a reflux apparatus with 100 c.c. of ether for half an hour. The solution is filtered, the insoluble matter washed with 80 c.c. of ether, and the filtrate shaken in a separating funnel with 10 c.c. of 10 per cent. hydrochloric acid. The aqueous solution is drawn off and the ether washed with another 5 c.c. of water. The acid solution containing the alkaloids is now shaken with 70 c.c. of ether, and an excess of sodium hydroxide, and then once more with another 50 c.c. of ether; the liberated alkaloids dissolve in the ether, and are recovered by evaporation in a weighed flask. The process may be applied to all drugs which contain non-volatile alkaloids soluble in ether.

L. DE K.

Detection and Estimation of Morphine. By F. WIRTHLE (*Chem. Zeit.*, 1901, 25, 291—292).—Kippenberger has proposed to remove morphine from its solution in fixed alkalis by adding sodium or potassium hydrogen carbonate, and shaking with chloroform containing 10 per cent of alcohol [? by volume]. The author has not been successful with this process, but the morphine may be gradually and completely removed by first acidifying slightly with hydrochloric acid, then rendering alkaline with ammonia, and shaking five or six times in succession with fresh quantities of the chloroform-alcohol mixture.

The most delicate test for morphine, and one very useful to ascertain whether the extraction has been complete, is that proposed by Marquis.

The reagent consists of 2 drops of formaldehyde dissolved in 3 c.c. of sulphuric acid ; it gives a fine violet coloration with 0.1 milligram of the alkaloid.

L. DE K.

Estimation of Nicotine in Tobaccos or Tobacco Extracts. By JULES FOTH (*Rev. Intern. Falsif.*, 1901, 14, 12—14).—The tobacco is first dried over quicklime and then ground, powdered, or crushed. Six grams of the dried sample (or 10 grams of the aqueous extract) are mixed in a porcelain dish with 10 c.c. of aqueous sodium hydroxide (20 grams in 100 c.c.) and sufficient plaster of Paris is then added to obtain a dry mass. The mass is transferred to a glass tube 25 cm. long and 5 cm. in diameter, 100 c.c. of a mixture of equal volumes of ether and light petroleum are added, and after inserting a glass stopper the whole is well shaken. After remaining for an hour with occasional shaking, 25 c.c. of the ethereal liquid are pipetted off and introduced into a shaker, and mixed with 40—50 c.c. of water, and a drop of iodo-eosin. Excess of *N*/10 sulphuric acid is added and the liquid then titrated with *N*/10 sodium hydroxide. One c.c. of *N*/10 sulphuric acid neutralised equals 0.0162 gram of nicotine.

L. DE K.

Composition of certain Fruit Juices used in the Preparation of Confectionery, Syrups, &c. By TRUCHON and MARTIN-CLAUDE (*J. Pharm.*, 1901, [vi], 13, 171—176).—Analyses are given of the juice of cherries (early and in season), strawberries (ditto), raspberries, red (unripe) and white gooseberries, peaches, pears, quinces, and apples ; also of the fruit itself (pulp and juice) of apricots, greengages, and yellow plums. Except in the case of peaches and apples which contain also sucrose, the saccharine matter of the above juices is entirely made up of invert sugar, no dextrose being found in any of them. Sucrose also occurs in apricots, greengages and plums.

Of the various natural colouring matters, only that of the peach communicates a yellow-red colour to amyl alcohol when treated in ammoniacal solution, but the colour does not dye silk. None of the natural colouring matters can therefore be mistaken for coal-tar colours.

To detect salicylic acid, the authors proceed as follows. One hundred c.c. of the juice previously diluted with an equal bulk of water are mixed with 2 c.c. of strong ferric chloride, and then with 10 grams of calcium carbonate. The filtrate is agitated with ether and the ethereal residue is then tested as usual with dilute ferric chloride.

L. DE K.

Adamkiewicz's Proteid Reaction. By F. GOWLAND HOPKINS and SIDNEY W. COLE (*Proc. Roy. Soc.*, 1901, 68, 21—33).—See this vol., i., 310.

Comparison of Reagents for Milk Proteids with some Notes on the Kjeldahl Method for Nitrogen Determination. By A. VIVIAN (*Exper. Stat. Record*, 1900, 12, 19—20 ; from *Wisconsin Stat. Rep.*, 1899, 179—186).—Cheese is emulsified by rubbing with warm water, acidified with acetic acid, and boiled. Milk is also acidified with acetic acid and boiled. Total nitrogen, and nitrogen not precipi-

tated by acetic acid and heat were determined. Portions of the extracts were treated with zinc sulphate, tannic acid and sodium chloride, and phosphotungstic acid; nitrogen was determined in the filtrates, the precipitated nitrogen being estimated by difference.

The different groups thus determined are as follows:—Insoluble nitrogen (casein, globulin, and albumin); nitrogen in albumoses (total soluble nitrogen less nitrogen in zinc sulphate precipitate); nitrogen in peptones (by tannin, and by phosphotungstic acid); nitrogen in amides (difference between nitrogen in filtrate from phosphotungstic acid and in ammonia); and nitrogen in ammonia.

Cheddar cheese, 6 months old, was found to contain the following amounts of nitrogen:—Insoluble, 3.18; as albumoses, 0.06; peptones by tannin, 0.16; peptones by phosphotungstic acid, 0.13; amides, 0.86; and ammonia, 0.09 per cent.

In determining total nitrogen in cheese, boiling with sulphuric acid must be continued for a considerable time after the solution has become colourless in order to avoid frothing during the distillation. The digestion with acid of the filtrates from milk in the methods above described must be watched closely, and when most of the water has boiled off, the gas must be turned very low for 15—30 minutes. When digested with sulphuric acid, the filtrate from zinc sulphate requires the addition of 0.5 gram of zinc dust, to prevent bumping.

N. H. J. M.

Elimination and Toxicological Detection of Cacodylic Acid.
BY LÉONCE BARTHE and R. PÉRY (*J. Pharm.*, 1901, [vi], 13, 209—214).—The introduction of cacodylic acid into therapeutics has opened up the problem of the detection of the arsenic in this stable compound, with a view to the study of its elimination from the organism. Imbert and Badel evaporate urine with nitric acid, fuse the residue with alkali nitrate and carbonate, and expel the nitric acid by sulphuric acid. The authors find that during the fusion there is generally a cacodylic odour, and always during the subsequent passage of hydrogen sulphide, or the testing with Marsh's apparatus, and quantitative estimations show that the whole of the arsenic is not recoverable from the fused mass, part of the cacodylic acid seeming to escape undecomposed. A distinct odour is obtained when 0.01 mg. of cacodylic acid is introduced into a Marsh's apparatus, whilst 1 mg. mixed with 100 c.c. of urine yields both an arsenical ring and the odour. Elimination commences rapidly, arsenic being detected in the first urine passed after a dose administered by the stomach, but is completed very slowly, arsenic having been found in the urine 70 days after ceasing to take cacodylic acid.

M. J. S.

General and Physical Chemistry.

Refractive Power of the Hydro-derivatives of Cyclic Chains.
By G. PELLINI (*Gazzetta*, 1901, 31, i, 1—18).—Measurements have been made of the refractions of dihydronaphthalene, tetrahydronaphthalene, dihydroanthracene (in benzene), tetrahydrophenanthrene, acenaphthene (in benzene), and acenaphthalene (in benzene). The following table contains the mean experimental numbers for the molecular refractions for the line H_α , together with the calculated values :

	$M. \frac{\mu_{H\alpha} - 1}{d}$			$M. \frac{\mu_{H\alpha}^2 - 1}{(\mu_{H\alpha}^2 + 2)d}$		
	Found.	Calc.	Diff.	Found.	Calc.	Diff.
Dihydronaphthalene.....	74.25	72.6	1.65	42.75	42.32	0.43
Tetrahydronaphthalene..	74.05	72.8	1.25	42.94	42.62	0.32
Dihydroanthracene	101.82	100.00	1.82	58.70	57.88	0.82
Tetrahydrophenanthrene	101.62	100.2	1.42	58.40	58.18	0.22
Acenaphthene	94.62	85.00	9.62	53.67	49.06	4.61
Acenaphthalene.....	90.08	84.8	5.28	51.64	48.76	2.88

Below are the values of the dispersions for the fundamental nuclei compared with those of their hydro-derivatives :

	$\frac{\mu_{H\beta} - \mu_{H\alpha}}{d}$	$\frac{\mu_{H\beta}^2 - 1}{\mu_{H\alpha}^2 - 1}$		$\frac{\mu_{H\beta} - \mu_{H\alpha}}{d}$	$\frac{\mu_{H\beta}^2 - 1}{\mu_{H\alpha}^2 - 1}$
Naphthalene.....	0.0297	1.0366	Dihydronaphthalene	0.0223	1.0481
			Tetrahydronaphthalene .	0.01881	1.0416
			Hexahydronaphthalene {	0.0158	1.0192
Anthracene.....	0.0681	1.0887	Dihydroanthracene.	0.01615	1.0415
Phenanthrene	0.0452	1.2228	Tetrahydrophenanthrene	0.01939	1.0432
Acenaphthalene..	0.03558	1.0701	Acenaphthene	0.02891	1.0580

It has been shown that naphthalene and other complex cyclic compounds give values for the molecular refraction much higher than those calculated from the laws of Landolt and Brühl (see Chilesotti, *Abstr.*, 1900, i, 339). The above results show, however, that on passing to the hydro-derivatives of such cyclic compounds, these deviations of the actual from the calculated molecular refractions disappear. This behaviour, which is quite different from that of benzene and its hydrogen additive compounds, is in agreement with the views of Bamberger, who showed (*Abstr.*, 1890, 1299) that the fundamental cyclic nuclei have special chemical properties which are lost on hydro-

genation, the compounds then assuming the properties of benzene derivatives. Thus dihydroanthracene has the two added hydrogen atoms in the middle nucleus, the two lateral nuclei of the anthracene becoming converted into benzene nuclei. Bamberger (*loc. cit.*) has shown that the chemical properties of such compounds are in accord with these views.

A discussion of the various structural formulæ for benzene follows, and the author concludes that, taking into consideration the optical properties alone, the centric formula for benzene and condensed benzene nuclei best explains the observed phenomena. For acenaphthalene and acenaphthene centric formulæ are not possible.

T. H. P.

Spectra of Carbon Compounds. By ARTHUR SMITHELLS (*Phil. Mag.*, 1901, [vi], 1, 476—503).—A discussion of the origin of the Swan or hydrocarbon flame spectrum. According to the author, the view which attributes the Swan spectrum to elementary carbon lacks trustworthy experimental support neither has any rational explanation been given of its relation to the line spectrum of carbon. There is evidence also against the view that the Swan spectrum is due to the presence of a hydrocarbon. The theory is advanced that carbon monoxide is the source of the spectrum in question, and this is shown to be consistent with numerous facts, amongst others the direct formation of carbon monoxide in the combustion of carbon and its compounds. This view has been thought inconsistent with the behaviour of carbon compounds under the electric discharge, but the author (who has reinvestigated the spectra of the oxides of carbon) attributes the Swan and oxycarbon spectra to carbon monoxide and carbon dioxide respectively, and shows that on this basis a simple and rational explanation of the facts can be given.

The chief difficulty of the author's theory lies in the cases where the Swan spectrum has been observed in the absence of oxygen; thus it has been found in the electric spectrum of hydrocarbons, of carbon tetrachloride, of cyanogen, and in the spectrum produced by an electric discharge between carbon points in an atmosphere of hydrogen. The author holds that in these cases oxygen and oxygen compounds have not been completely removed, and shows by his own experiments that when a discharge takes place between carbon electrodes in an atmosphere of hydrogen, the Swan spectrum fades as the hydrogen is more thoroughly purified.

J. C. P.

Spectra of Flames resulting from Operations in the Open-Hearth and Basic Bessemer Processes. By W. NOEL HARTLEY and HUGH RAMAGE (*Proc. Roy. Soc.*, 1901, 68, 93—97. Compare Hartley, *Abstr.*, 1895, ii, 432).—Line spectra are not observed in the open-hearth furnace, probably because of the oxidising atmosphere. The phenomena of the "basic" Bessemer blow differ considerably from those of the "acid" process. A flame is visible from the commencement of blowing, originating probably from carbonaceous matter in the lining of the vessel. Volatilisation of metal occurs largely at an early period in the blow, and subsequent to this a very large amount of fume is formed, the oxidation of metal and phosphorus producing a

high temperature. The "over-blow" is characterised by a very powerful illumination, accompanied by a dense fume composed of oxidised metallic vapours; the particles must be very minute, for they scatter the light falling on them, and the cloud casts a brown shadow. The spectrum is continuous, but does not extend beyond wave-length 4000. With regard to the spectra of the flames from the first stage of the "basic" process, it is noted that the manganese bands are relatively feeble, and lines of elements, not usually associated with Bessemer metal, are present. Lithium, sodium, potassium, rubidium, and caesium have been traced mainly to the lime; manganese, copper, silver, and gallium to the metal. The intensity of metallic lines (particularly some iron lines) has been observed to vary with the temperature; as the temperature of the flame rises, some lines fade almost entirely, others become stronger. A new potassium line, with wave-length approximately 4642, varies in intensity within rather wide limits. In a given flame, its brilliancy is increased by diminishing the quantity of metallic vapour in the flame, probably owing to the greater freedom of motion thus permitted to the molecules.

J. C. P.

Spark Spectrum of Silicon as rendered by Silicates. By W. NOEL HARTLEY (*Proc. Roy. Soc.*, 1901, 68, 109—112).—In reference to Lunt's paper (*Abstr.*, 1900, ii, 585), the author has re-examined the spectra obtained by him in 1883 from solutions of silicates, but does not find any trace of silicon lines between 4573 and 4553, where Lunt found three. The difference in results is attributed to the different conditions under which the spectra were obtained. The paper contains a table giving the normal length of the six lines in the characteristic group as they are seen when a 1 per cent. (or weaker) solution and graphite electrodes are used.

J. C. P.

Band Spectra of Alumina and Nitrogen. By G. BERNDT (*Ann. Phys.*, 1901, [iv], 4, 788—795).—The band spectrum of aluminium has been attributed by some investigators to the oxide, by others to the metal itself. The author has examined tubes fitted with aluminium electrodes and filled with nitrogen, hydrogen, and oxygen, and concludes that the band spectrum is due to the oxide and not to the metal itself, the presence of oxygen being necessary for its production. In the band spectrum of nitrogen, which has also been investigated, fifteen groups of lines are distinguished, and the wave-lengths of these are communicated in full.

J. C. P.

Absorption Spectra of Chloroanilic and Bromoanilic Acids and their Alkaline Salts. By CARLO FIORINI (*Gazzetta*, 1901, 31, i, 33—39).—The author has made comparative measurements of the absorption spectra and electrical conductivities of chloroanilic and bromoanilic acids, and of their alkali-salts. A Hüfner-Albrecht spectrophotometer was employed, the coefficient of extinction ϵ being obtained by means of the rotation of an analysing nicol. The numbers obtained show that the small colour intensity of the salts corresponds with a high degree of dissociation, whilst in the case of the acids a high colour intensity corresponds with a much lower dissociation. It is

hence the non-dissociated molecules which principally contribute to the colour, the ions being much less coloured. It is not possible, however, to calculate the ratio between the colouring powers of the non-dissociated molecules and of the ions.

T. H. P.

Theory of Colour Shade. By CARL LIEBERMANN (*Ber.*, 1901, 34, 1040—1042).—The author calls attention to the fact that by the introduction of hydroxyl groups the red colour of alkaline solutions of aurin becomes changed into the blue-black of hexahydroxyaurin, and similarly the red colour of rosaniline becomes converted into the blue of hexahydroxyrosaniline. The replacement of the hydrogen of the hydroxyl groups by methyl has little effect on the shade of colour. Numerous examples are quoted to show that entrance of hydroxyl groups into a colouring matter brings about a change of tint in the order: yellow \rightarrow orange \rightarrow red \rightarrow violet \rightarrow blue \rightarrow black. The position as well as the number of hydroxyl groups is of importance, as is illustrated by the colours of alkaline solutions of the various hydroxyanthraquinones. The azo- and amino-groups exert a similar influence, whilst the sulphuryl group does not.

K. J. P. O.

A New Method of testing colourless Carbon Compounds for Absorption of Light. By JOHANNES PINNOW (*J. pr. Chem.*, 1901, [ii], 63, 239—240).—The method outlined in this preliminary notice is based on the observation that substances known to be affected by light have the power of diminishing the fluorescence of β -naphthylamine, anthracene, quinine sulphate, acridine sulphate, and fluorescein; conversely, substances which produce a diminution of fluorescence are decomposed by light.

J. C. P.

Researches on Standard Cells, especially the Weston Cadmium Cell. By WILHELM JAEGER and STEPHAN LINDECK (*Ann. Phys.*, 1901, [iv], 5, 1—50).—The ratio of the *E.M.F.*'s of a large number of Clark and Weston cells has been determined, and the results confirm earlier investigations. Cadmium cells with 14.3 per cent. amalgam exhibit irregularities in the neighbourhood of 0°, but are quite regular from 10° upwards. It is better to use 12 or 13 per cent. amalgam in the cadmium cells; these show no irregularity even at 0°, and are therefore admirably suited for use as standards. The authors' results are at variance with those of Cohen (*Abstr.*, 1900, ii, 702; this vol., ii, 142. Compare also Jaeger and Lindeck, *Abstr.*, 1900, ii, 703).

J. C. P.

Irregularities of the Cadmium Standard Cell. By C. H. WIND (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 3, 595—601).—Many of the irregularities observed in the behaviour of Weston cadmium cells (see Jaeger and Wachsmuth, *Abstr.*, 1897, ii, 86; Jaeger, *Abstr.*, 1898, ii, 364; Kohnstamm and Cohen, *Abstr.*, 1898, ii, 495; Cohen, *Abstr.*, 1900, ii, 702; this vol., ii, 142; Jaeger and Lindeck, *Abstr.*, 1900, ii, 703; preceding abstract) may be explained by the existence of two phased equilibria in the cadmium amalgam, and by retardations in the attainment of the equilibria. The recommendation of the Physikalisch-Technische Reichsanstalt that an amalgam with less than 14.3 per cent. of cadmium should be used, insures a cell with a perfectly

definite *E.M.F.*, and makes the cadmium cell more serviceable as a standard. J. C. P.

Pyrogenic Daniell Cells. By R. SUCHY (*Zeit. anorg. Chem.*, 1901, 27, 152—198).—The *E.M.F.* of cells of the Daniell type containing fused salt instead of solution have been determined over a wide range of temperature. The cell was either of the U-shaped type used by Weber (Abstr., 1899, ii, 724) or, to further prevent diffusion, the fused salts and the metal regulus were contained in closed tubes pierced near the top with a small hole and immersed in a bath of one of the fused salts. This bath was heated by a special furnace, whereby the temperature (measured by a Le Chatelier pyrometer) was maintained constant. The results obtained at temperatures above 520° were :

Cell.		<i>E.M.F.</i>
Pb | PbCl ₂ | AgCl | Ag	.....	0.349 - 0.000361 (<i>t</i> - 520°) volt.
Pb | PbCl ₂ | KCl + LiCl | AgCl | Ag	.....	0.339 - 0.000357 (<i>t</i> - 520°) „
Zn | ZnCl ₂ | PbCl ₂ | Pb	.....	0.276 - 0.000096 (<i>t</i> - 520°) „
Zn | ZnCl ₂ | AgCl | Ag	.....	0.496 volt at 520°
		0.339 „ at 680°.

Lorenz (Abstr., 1900, ii, 61) concludes that the *E.M.F.* of a cell $M_1 | M_1X | M_2X | M_2$ should be equal to the difference of the *E.M.F.* of $M_1 | M_1X | X$ and $M_2 | M_2X | X$. In order to institute a comparison, the *E.M.F.* of the following simple cells were also determined :

Cell.		<i>E.M.F.</i>
Zn | ZnCl ₂ | Cl ₂	.....	1.662 - 0.000751 (<i>t</i> - 430°) volts.
Ag | AgCl | Cl ₂	.....	0.902 volt at 480°.
		0.842 „ at 670°.

If we take account also of Weber's (*loc. cit.*) measurement of the *E.M.F.* of the cell $Pb | PbCl_2 | Cl_2 = 1.282 - 0.000584 (t - 506)$ volt, we find that denoting $M_1 | M_1X | X$ by E_1 , $M_2 | M_2X | X$ by E_2 , and $M_1 | M_1X | M_2X | M_2$ by E , the difference $E_1 - E_2$ is not equal to E , as Lorenz concludes it should be. Instead, it is invariably higher, that is, $(E_1 - E_2) - E$ has a positive value. From these differences the author calculates, on the assumption that the *E.M.F.* of the liquid cell formed by the two fused salts is negligible, the ratio of the ionic concentrations of the metals to be :

$$C(\text{Ag})/C(\text{Pb}) = 3.2 : C(\text{Pb})/C(\text{Zn}) = 2.2 : C(\text{Ag})/C(\text{Zn}) = 60.2.$$

This third value, when calculated from the first two, amounts only to 7.0, and this disparity shows that the liquid cell referred to cannot be neglected, and herein there is a perfect analogy between Daniell cells with fused salts and those with solutions. The analogy between the two is strengthened by the fact that by diluting the salt at the cathode the *E.M.F.* gradually sinks, becomes zero, and ultimately changes sign, just as in ordinary solution cells.

From measurements with the cell $Pb | PbCl_2 | AgCl | Ag$, in which the concentration of the AgCl was varied, it has been possible to arrive at the degree of dissociation of fused silver chloride at high temperatures ; $\alpha(520^\circ) = 0.17$, $\alpha(640^\circ) = 0.28$, $\alpha(730^\circ) = 0.60$. J. McC.

[E.M.F. of Concentration Cells.] By WALTHER NERNST (*Zeit. physikal. Chem.*, 1901, 36, 596—604).—A reply to criticisms of Arrhenius, Kohnstamm, Cohen, and Noyes. It is shown that the expression for the *E.M.F.* of a concentration cell given by Arrhenius (this vol., ii, 144) is identical with that of the author to which Arrhenius objects (see also Jahn, this vol., ii, 299). Other criticisms of various authors are also replied to or discussed. L. M. J.

Capillary-electrical phenomena. By WILHELM PALMAER (*Zeit. physikal. Chem.*, 1901, 36, 664—680).—The paper contains a discussion of the theories of Helmholtz, Warburg, and Nernst, regarding electrocapillary phenomena, in which the author considers that there is no evidence to support Helmholtz's view of the influence of time or to support Warburg's idea of the capability of mercury to cause a condensation of the solution at its surface. Further, the explanation of Warburg would necessitate an inconceivably high concentration of the salt in the layers of solution contiguous to the mercury. The Nernst theory explains most of the facts without the necessity of any new hypothesis, both in regard to the phenomena obtained with pure mercury and with amalgams, whereas Warburg's theory necessitates contradictory suppositions with different amalgams. (Compare Abstr., 1898, ii, 276). L. M. J.

Rate of Electrolytic Deposition of Copper in Presence of Sulphuric Acid. By JOS. SIEGRIST (*Zeit. anorg. Chem.*, 1901, 26, 273—321).—When a solution of copper sulphate in sulphuric acid of maximum conductivity (sp. gr. 1.225 at 15°) is electrolysed at constant temperature, a constant current and platinum electrodes being used and the solution well stirred, the rate of deposition of copper, dx/dt , is proportional to the current (as is required by Faraday's law) so long as the concentration exceeds a certain value, or, expressed in symbols, $dx/dt = k \dots (1)$, where k is a constant. As the concentration diminishes, the rate of deposition becomes smaller, and finally becomes proportional to the concentration of the copper sulphate, $dx/dt = k'(a-x) \dots (2)$, where a is the initial concentration of the copper, x the quantity deposited, and k' another constant having a smaller value than k in equation (1). Between the concentrations at which equations (1) and (2) hold good, there is a series of concentrations for which $dx/dt = k''(a-x)^n$, k'' having values between k and k' , and n passing through all values between 0 and 1.

The value of k' in equation (2) is much affected by, and increases with, the rate of stirring; it is also proportional to the temperature, and increases as the current density diminishes. T. E.

Amphoteric Electrolytes and Internal Salts. By K. WINKELBLECH (*Zeit. physikal. Chem.*, 1901, 36, 546—595).—Many weak electrolytes exhibit both acidic and basic characters, for example, many metallic hydroxides, the oximes, and amino-acids. Such compounds are termed amphoteric, and the cause of the peculiarity lies most probably in the capability of forming, or of combining with, either hydrogen or hydroxyl ions. The author has determined the hydrogen and the hydroxylic dissociation for a number of such compounds, em-

playing both the conductivity method used by Walker (Abstr., 1890, 5) and the method of hydrolysis due to Shields (Abstr., 1893, ii, 448). The compounds investigated were betaine (hydroxylic dissociation only), sarcosine, leucine, glycine, alanine, taurine, asparagine, *o*-, *m*-, and *p*-aminobenzoic acids, aspartic acid, and (hydrogen dissociation only), hippuric, sulphanilic and sulphamic acids. No clear connection appears to exist between the acidic and basic characters, thus in the series, alanine, glycine, leucine, sarcosine, betaine, the hydrogen and hydroxylic dissociation decrease together, whilst the same obtains in the case of the aminobenzoic acids. For sulphamic, sulphanilic, and hippuric acids, however, where the hydrogen dissociation is considerably greater, the hydrolytic dissociation is exceedingly small, and was not measured. The acid of methyl-orange was also examined and found to be considerably stronger than carbonic acid; hydrocyanic acid exhibits no basic function; hydroxylamine was found to be a fairly strong base and to possess only very slight acid properties, whilst no acidity was found in the case of carbamide. If the amino-acids are regarded as internal salts, they are capable of being hydrolysed by water just as other salts of weak acids with weak bases, that is, the water can, as a weak base or weak acid, form undissociated salts with the acid or basic group.

L. M. J.

Relation between the Dissociation Constant and the Degree of Dissociation of an Electrolyte in the presence of other Electrolytes. By YUKICHI ŌSAKA (*Zeit. physikal. Chem.*, 1901, 36, 539—542).—The author, by consideration of the dissociation in the case of a system of electrolytes in solution, obtains the following result. The degree of dissociation of a very weak electrolyte is equal to its dissociation constant divided by the total concentration of all the anions or cations in the solution. This conclusion had been previously stated by Arrhenius, but without a general proof.

L. M. J.

Pyrogenetic Reactions induced by the Electric Current. By WALTHER LÖB (*Ber.*, 1901, 34, 915—918).—Water, when heated by an electric arc generated between carbon poles, interacts with this element yielding a mixture of hydrogen, carbon monoxide, carbon dioxide, and small quantities of saturated and unsaturated hydrocarbons. Methyl alcohol, when similarly treated, gives rise to methane, hydrogen, and formic acid, together with traces of acetylene and the oxides of carbon; formaldehyde could not, however, be detected among the products of decomposition. Acetic acid furnishes hydrogen, saturated and unsaturated hydrocarbons, and the oxides of carbon. The gas produced by the decomposition of benzene and naphthalene consists chiefly of hydrogen, the liquid products are contaminated by separated carbon and yield no definite compounds. These results are obtained both with direct and alternating currents and the products of decomposition are the same, whether the substance under treatment is in the liquid or the gaseous state. When methyl alcohol is maintained in contact with a wire heated to redness by the electric current, it decomposes, yielding hydrogen, carbon monoxide, methane, and formic acid, together with traces of trioxymethylene and carbon dioxide. Under these conditions,

benzene gives rise to diphenyl and a hydrocarbon of higher melting point, probably diphenylbenzene, aniline undergoes condensation forming diphenylamine and carbazole with the elimination of ammonia, and nitrobenzene is decomposed into nitric oxide and a solid compound not yet characterised.

G. T. M.

Generalisation of Trouton's Law. By ROBERT DE FORCRAND (*Compt. rend.*, 1901, 132, 878—882).—It has been shown by Le Chatelier and Matignon (*Abstr.*, 1899, ii, 273) that a relation similar to Trouton's law holds for many dissociable compounds, that is, that the heat of formation divided by the temperature at which the dissociation pressure is 760 mm. gives values which vary from 23 to 32, being in most cases about 30. The case of dissociation is not, however, completely analogous to the evaporation, alone considered in Trouton's law, as it involves the formation of a gas from a solid, and the author states that if the heat of fusion is added to the heat of vaporisation for the determination of Trouton's constant, the quotient then obtained agrees with that found for dissociation. The law may hence be generalised thus: In chemical or physical changes, the heat of solidification of any gas is proportional to its temperature of vaporisation under atmospheric pressure. This is stated to be valid for carbon dioxide, ammonia, water, glycol, chlorine, bromine, iodine, phenol, benzene, naphthalene, ethylene dibromide, methyl oxalate, and formic, acetic, and butyric acids, the quotients only varying between 28 and 32.

L. M. J.

Modification of Landsberger's Apparatus for the Determination of the Elevation of the Boiling Point. By C. N. RIIBER (*Ber.*, 1901, 34, 1060—1064).—Landsberger's apparatus (*Abstr.*, 1898, ii, 283) has been modified in such a manner that the vapour of the solvent, after leaving the tube containing the solution, passes into a condenser so arranged that the condensed liquid can flow back into the flask. The advantages of this method are that much less solvent is required, that a slight impurity in it exerts very little influence since the liquid in the flask has always the same composition, and consequently the composition and temperature of its vapour are constant, and that no interruption of the boiling is necessary. The results of a number of determinations are appended. For details of the method, the description and diagram in the original must be consulted.

E. G.

Vaporisation of Binary Mixtures. By PIERRE DUHEM (*Zeit. physikal. Chem.*, 1901, 36, 605—606).—A reply to Kohnstamm (this vol., ii, 145), in which it is pointed out that the theory of Van der Waals is quite insufficient in the case of binary mixtures, as is evident from the recent work of Caubet (this vol., ii, 147).

L. M. J.

Vapour Pressure of Ternary Mixtures. By FRANZ A. H. SCHREINEMAKERS (*Zeit. physikal. Chem.*, 1901, 36, 710—740).—A continuation of the previous papers (this vol., ii, 224, 305; compare this vol., ii, 146) in which the effect of pressure and, briefly, of temperature, on the course of the vaporisation and condensation curves are considered.

L. M. J.

Cryoscopic Researches. By PAUL CHRUSTSCHOFF (*Compt. rend.*, 1901, 133, 955—957).—The author adds details of the apparatus and of the method of observation by which the results previously recorded were obtained (this vol., ii, 86). L. M. J.

Cryoscopic Experiments with the Bromides of Arsenic and Antimony. By FELICE GARELLI and VITTORIO BASSANI (*Atti Real. Accad. Lincei*, 1901, [v], 10, i, 255—262. Compare Tolloczko, *Abstr.*, 1900, ii, 190; *Bull. Acad. Sci. Cracow*, 1901, 1).—For the determination of the molecular depressions of the freezing points, cryoscopic measurements were made of benzene, bromoform, iodine, arsenic tri-iodide and trichloride, stannic iodide, antimony chloride and bromide in arsenic bromide solution and of diphenyl, diphenylmethane, bromoform, antimony chloride, arsenic tri-iodide and tri-bromide in antimony bromide. The following conclusions are drawn.

The mean molecular freezing point depression for arsenic bromide is 194.2, which agrees well with the value given by Raoult's empirical rule, namely, 195.3. Tolloczko (*loc. cit.*) gave 206.

Solutions of antimony chloride in arsenic bromide give freezing point depressions much less than the theoretical, a fact ascribed by the authors to the formation of solid solutions. Tolloczko also found small depressions for solutions of arsenic bromide in antimony chloride, and he supposed that either dissociation or a chemical action such as $\text{AsBr}_3 + \text{SbCl}_3 = \text{AsBr}_2\text{Cl} + \text{SbCl}_2\text{Br}$, takes place. This explanation is untenable in the light of the author's observations. The small depressions obtained by Tolloczko for solutions of arsenic chloride in antimony chloride are probably also due to the analogy in constitution existing between the solvent and solute.

Anomalous values are also obtained for mixtures of the bromides of arsenic and antimony, and are evidently due to the formation of isomorphous mixtures.

Tolloczko (*loc. cit.*) corrects the number, 280, given by Garelli (*Abstr.*, 1899, ii, 271) for the molecular freezing point depression of stannic bromide, giving the value 306. The authors point out that both from the results of Tolloczko and those of Garelli, the latter number is probably high, whilst 280 agrees well with the value given by Raoult's rule, the melting point and latent heat of fusion leading to the number 260. T. H. P.

Determination of the Calorific Power of Fuels. By ORAZIO REBUFFAT (*Gazzetta*, 1901, 31, i, 78—82).—The author briefly considers the various methods for the determination of the calorific power of fuels, and criticises the recent publication of Antony and di Nola (this vol., ii, 6) on Berthier's method. Under the conditions stated by these authors, only a portion of the available hydrogen of the fuel takes part in the reduction of lead fluoride; the latter also reacts readily with sulphur and with compounds of silica. The experiments of von Jüptner (*Oester. Zeit. Berg. Hütt.*, 1893), which are not mentioned in Antony and di Nola's paper, are also referred to.

In order to obtain accurate numbers for the calorific values of fuels, it is necessary to make use of the calorimeter or the calorimetric bomb,

with which compressed oxygen is conveniently employed. Some commercial oxygen is produced by an electrolytic process, and so contains small proportions of hydrogen, which must be allowed for.

T. H. P.

Relation of the Viscosity of Mixtures of Solutions of Certain Salts to their State of Ionisation. By JAMES BARNES (*Trans. Nov. Scot. Inst. Sci.*, 1900, 10, 113—128).—The viscosity of mixtures of dilute salt solutions can be calculated from the formula: $P = Pw + 1/p[(k_1(1 - a_1)n_1 + l_1a_1n_1) \cdot v_1/(v_1 + v_2) + (k_2(1 - a_2)n_2 + l_2a_2n_2) \cdot v_2/(v_1 + v_2)]$, deduced by Macgregor (*Trans. Nov. Scot. Inst. Sci.*, 1896—1897, 9, 219), where Pw is the viscosity of water, k and l the ionisation constants, a the ionisation coefficients, and n the concentrations of the electrolytes, v the volumes of the constituent solutions, and p the ratio of the volumes of the solutions after and before mixing.

Applied to mixtures of potassium and sodium chlorides, potassium and barium chlorides, potassium and sodium sulphates, and potassium and copper sulphates, this formula leads to values which agree well with the viscosities found by Kanitz (*Abstr.*, 1897, ii, 308).

J. McC.

Employment of the Method of counting Drops for the Measurement of Surface Tensions. By PHILIPPE A. GUYE and F. LOUIS PERROT (*Arch. Sci. Phys. Nat. Geneva*, 1901, [iv], 11, 225—265, 345—388).—The authors accurately confirm the fact that the weight of a falling drop depends on the time taken for its formation. The method of falling drops gives results for the surface tension of organic liquids which agree with the more accurate values obtained by Ramsay and Shields (*Trans.*, 1893, 63, 1089) to within 1—2 per cent. This precision is quite sufficient when the observations are made with the view of determining the molecular association of a liquid, and the method may become of practical importance in physical chemistry. The authors describe an improved apparatus for carrying out the measurements at different temperatures, in which a certain number of drops are weighed, or the drops occupying a certain volume are counted.

J. McC.

Does a Law corresponding with that of Avogadro hold for the Solid State? Hardness of Metals and Alloys. By CARL BENEDICKS (*Zeit. physikal. Chem.*, 1901, 36, 529—538).—It was shown by Bottone (this Journ., 1875, 232) that in a series of 21 metals the hardness was proportional to the specific gravity and inversely proportional to the atomic weight, that is, was proportional to the atomic concentration. The later values of Rydberg (*Abstr.*, 1900, ii, 392) for the hardness of elementary substances according to Mohs' scale, also confirm the above generalisation. A few examples of various alloys are also used to deduce the law that the hardness of solid solutions increases with increase of osmotic pressure.

L. M. J.

Theory of Capillarity. By G. BAKKER (*Zeit. physikal. Chem.*, 1901, 36, 681—692).—An extension of previous mathematical papers (*Abstr.*, 1900, ii, 466; this vol., ii, 88), in which the author deduces

expressions connecting the molecular pressure and surface tension ; and further derives and discusses the Laplace expression.

L. M. J.

The "Myriotone" as Unit in Osmotic Measurements. By LEO ERRERA (*Bull. Acad. Roy. Belg.*, 1901, 3, 135—153).—The author proposes to term the pressure of one dyne per square centimetre a "tone" and to use the myriotone (= 10,000 tones) as the unit in gas and osmotic measurements. One myriotone is approximately equal to 1/100 atmosphere. When v is measured in litres and p in myriotones the constant R of the equation $pv = RT$ is equal to 8.32.

The symbol for the myriotone is \bar{M} .

J. McC.

Extent to which the Interaction of Ionic Charges diminishes the Osmotic Pressure. By VL. VON TÜRIN (*Zeit. physikal. Chem.*, 1901, 36, 524—528).—An extension and elucidation of the author's previous communication (Abstr., 1900, ii, 712).

L. M. J.

Etard's Law of Solubility. By ERNST COHEN and E. H. BÜCHNER (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 3, 561—565).—According to Etard (*Ann. Phys. Chem.*, 1898, [ii], 65, 344), the curves representing the solubility of salts as a function of the temperature are straight lines, provided the solubility be defined as the weight of salt in 100 grams of the saturated solution. The authors show from the work of various investigators that Etard's law is not in accordance with facts.

J. C. P.

Aqueous Solutions of Double Salts. IV. Iodides, Cyanides, Nitrates, and Sulphates. By HARRY C. JONES and B. PALMER CALDWELL (*Amer. Chem. J.*, 1901, 25, 349—390).—A continuation of previous work (Jones and Mackay, Abstr., 1897, ii, 396 ; Jones and Ota, Abstr., 1899, ii, 587 ; Jones and Knight, Abstr., 1899, ii, 628. Compare Lindsay, this vol., ii, 143). Study of the electrical conductivity shows that the double iodides of strontium and cadmium, and potassium and cadmium exist largely undecomposed in concentrated solution, breaking down more and more as the dilution increases. The same holds for the double nitrates of ammonium with praseodymium and neodymium, and for the double cyanide of potassium and mercury. The nitrates, however, break down at a comparatively early stage of dilution. The double sulphates of ammonium with cadmium, copper, magnesium, iron, nickel, and the double sulphate of potassium and nickel remain partly undissociated in concentrated solution, and even in dilute solution are not entirely broken down into their constituents.

Cadmium sulphate, potassium cadmium iodide, praseodymium nitrate, and ammonium praseodymium nitrate are substances whose molecular lowering of the freezing point of water does not increase regularly with the dilution ; there exists a well-defined minimum of the molecular depression, in each case about the concentration 0.2 normal.

J. C. P.

Measurement of the Work done by Affinity. By ERNST COHEN [and A. W. VISSER] (*Zeit. physikal. Chem.*, 1901, 36, 517—523).—Under the above title, van't Hoff, in the *Études de dynamique Chimique*, calculates the heat evolved by the conversion of the second system into the first in the equilibrium $\text{FeSO}_4 \cdot 7\text{H}_2\text{O} + \text{MgSO}_4 \cdot 6\text{H}_2\text{O} \rightleftharpoons \text{FeSO}_4 \cdot 6\text{H}_2\text{O} + \text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, employing the values for the vapour tension of the salts which were obtained by Wiedemann. As, however, these values are certainly inaccurate and do not agree with the later observations of Frowein (Abstr., 1888, 337), the authors have redetermined them at temperatures from 30° to 48°, employing Frowein's method. The value at 40° for the heat of hydration of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ is calculated as 3712 cal., agreeing well with Thomson's calorimetric value, 3700; the heat of hydration of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ was calculated as 1912 cal., and the vapour pressure of the iron salt is greater than that of the magnesium salt, so that the change is in the opposite direction to that stated by van't Hoff. The heat of transition at 40.02° is 1800 cal., the transition point 46.5°, and the work which can be performed owing to affinity, being $q(P - T)/P$ where P is the transition temperature, reduces to 1800 - 5.632 T .
L. M. J.

Theory of Catalytic Reactions. By HANS EULER (*Zeit. physikal. Chem.*, 1901, 36, 641—663).—See Abstr., 1900, ii, 532.

Velocity and Catalysis in Heterogeneous Systems. By K. DRUCKER (*Zeit. physikal. Chem.*, 1901, 36, 693—709).—The formula of Noyes and Whitney for the rate of dissolution of a solid in its own solution is insufficient, as it does not take into account the volume of the solution (Abstr., 1897, ii, 479), and the author deduces a formula of more extended applicability in which the velocity of dissolution is a function of the volume, its validity being indicated by experiments with barium hydroxide. The experiments of the author on the rate of solution of arsenious oxide in the presence of various acids are also considered (this vol., ii, 230). The rate of dissolution differs but little for the two acids, hydrochloric and sulphuric, and is approximately proportional to the square root of the H^+ concentration; the effect of HO^+ ions is more marked, but the same proportionality obtains. The formula of Noyes and Whitney for the rate of dissolution was not found to be valid, as the velocity, until very near the saturation concentration, was not dependent on the concentration of the arsenious oxide in the solution, but only on that of the catalysing acid.
L. M. J.

Equilibrium between the different Stages of Oxidation of the same Metal. By EMIL ABEL (*Zeit. anorg. Chem.*, 1891, 26, 361—437).—Two classes of equilibria between the ions of the same metal possessing different valency are distinguished. In the first class, the metal is in contact with the solution containing the ions and the reaction which occurs is represented by the equation, (1), $nM^{(m)} + (m - n)M \rightleftharpoons mM^{(n)}$, where M , $M^{(m)}$ and $M^{(n)}$ represent respectively the neutral metal and the ions with m and n charges of electricity (m is supposed to be greater than n). Since the active

mass of the solid metal is constant, we have in equilibrium $[M^{(m.)}]^n/[M^{(n.)}]^m = \text{constant}$, where the expressions in square brackets represent the concentrations of the ions. The second class of equilibria is characterised by the presence of the undissolved, electrically neutral substance furnishing the anion. When A' represents a univalent anion, and A the neutral substance, the reaction is represented by the equation, (2), $M^{(m.)} + (m-n)A' \rightleftharpoons M^{(n.)} + (m-n)A$, and in equilibrium $[M^{(m.)}][A']^{m-n}/[M^{(n.)}] = \text{constant}$. Equations are also obtained representing the potential difference between a metal and a solution containing m - and n -valent ions in equilibrium for which the original must be consulted.

From equation (2) it follows that as the concentration of the m -valent ions is increased that of the n -valent ions is increased also, and that finally a point may be reached at which the solubility product of the salt corresponding with the lower (n -valent) stage of oxidation is attained. This salt then separates out as a solid and any attempt to further increase the concentration of the m -valent ions merely increases the quantity of the solid salt. If this point is reached before the solubility product of the m -valent salt has been exceeded, it will not be possible to prepare this salt in the solid state (from aqueous solutions).

The experimental part of the paper deals with salts of mercury and copper.

Solutions of mercuric nitrate in 0.3*N* nitric acid are shaken with mercury until equilibrium is attained and the concentrations of the mercurous and mercuric salts in the solution determined. These concentrations may be taken to be nearly proportional to the concentrations of the corresponding ions. The ratio $[\text{HgNO}_3]/[\text{Hg}(\text{NO}_3)_2]$ is found to be constant and equal to 239.5 at 25°. This shows that the two ions have the same valency and that the reaction therefore takes place in accordance with the equation $\text{Hg}^{++} + \text{Hg} = \text{Hg}^+ - \text{Hg}^+$, the mercurous ion consisting of two atoms.

Phenomena such as the non-existence of mercurous cyanide and sulphide, the formation of mercuric chloride and mercury by boiling calomel with hydrochloric acid or a solution of potassium chloride, &c., are shown to be explained by the equilibrium between the mercurous and mercuric ions.

When an acid solution of cupric sulphate is shaken with copper (in absence of oxygen) some of the metal is dissolved, cuprous sulphate being formed. When this solution is electrolysed, the quantity of copper deposited at the cathode is very slightly in excess of that which would be deposited if nothing but cupric ions were discharged. From a solution containing cupric and cuprous ions in equilibrium, the two kinds of ions should, according to Nernst, be deposited in proportion to their concentrations. Calculating the concentration of the cuprous ions on the assumption that the cuprous salt is normally dissociated, the excess of copper deposited by electrolysis would be from 8 to 20 times that actually found. It follows, therefore, that cuprous sulphate is dissociated to an abnormally small extent, probably owing to the formation of complex ions.

The velocity of reaction between copper and an acid cupric sulphate solution increases rapidly with the temperature. Equilibrium is best

attained by heating the solution with copper at 100° and then allowing it to cool at the required temperature, when copper crystallises out. For solutions of cupric sulphate in normal sulphuric acid, it is found that the expression $\sqrt{[\text{CuSO}_4]/[\text{Cu}_2\text{SO}_4]}$ is constant at constant temperature, $[\text{CuSO}_4]$ and $[\text{Cu}_2\text{SO}_4]$ being the concentrations of the cupric and cuprous sulphates in equilibrium in gram-molecules per litre. The values of the constants are: 82.4 at 100° , 136.7 at 40° , 157.2 at 25° , and 317.7 at 0° . From this it follows that the complex cuprous ion is univalent and that the reaction is represented by the equation $\text{CuSO}_4 + \text{H}_2\text{SO}_4 + \text{Cu} = 2\text{HCuSO}_4$. Silver sulphate behaves in a similar way, as is shown by the fact that it is more soluble in solutions of sulphuric acid or of alkali sulphates than in pure water. If the solution of cupric sulphate is insufficiently acid, cuprous oxide separates out, since, owing to the greater concentration of the OH ions, the small solubility product of this compound is soon reached.

Determinations of the solubility of cuprous chloride in hydrochloric acid lead to the conclusion that complex ions are formed, the greater part of which possess the formula Cu_2Cl_4 , the equation being $2\text{HCl} + \text{Cu}_2\text{Cl}_2 = \text{H}_2\text{Cu}_2\text{Cl}_4$. In conformity with this conclusion, it is found that the freezing point of hydrochloric acid is raised when cuprous chloride is dissolved in it.

Since the small quantity of cuprous salt which can exist in equilibrium in a solution of cupric sulphate is, for the greater part, present in the form of a complex ion, it follows that the ratio between the concentration of cupric and cuprous ions in equilibrium must have a very large value. Colourless solutions of cuprous salts (which contain practically no cupric ions) must therefore contain almost immeasurably small quantities of cuprous ions, and the cuprous copper in such solutions must exist in the form of complex ions. A cuprous salt which could dissolve appreciably in water and which could undergo normal electrolytic dissociation would at once decompose into a cupric salt and copper; the non-existence of cuprous nitrate is explainable in this way. The cuprous salts known are all practically insoluble in water. The impossibility of preparing solid cuprous sulphate from aqueous solution is explained similarly.

The paper concludes with an account of a careful investigation of the copper voltameter, more especially with small current densities, the principal results of which are:

When a solution of copper sulphate which has been treated with copper until equilibrium is attained is electrolysed in an atmosphere of hydrogen or nitrogen with a small current density, the increase of weight of the cathode is smaller and the decrease of weight of the anode greater than would theoretically be anticipated. The differences depend on the concentration of the sulphuric acid used.

A dissolution of the electrodes appears to take place which may be due to a reduction of the sulphuric acid present, which gives rise to the formation of more complex cuprous ions, owing to which equilibrium is disturbed and further quantities of copper are dissolved.

The separation of the electrodes by a capillary tube or by a porous diaphragm and a preliminary electrolysis of the solution with a weak current eliminate the errors above-mentioned almost completely.

The results obtained with the copper voltameter are more exact at low temperatures than at higher ones. T. E.

Chemical Energy of Formic Acid. Displacement of the Nitric Acid of Nitrates by Formic Acid. By PAUL CAZENEUVE (*Bull. Soc. Chim.*, 1901, [iii], 25, 427—428).—The heat of neutralisation of formic acid by bases is less than that of nitric acid, but nevertheless the former is capable of displacing the latter, as is shown by the red coloration produced when concentrated formic acid is added to a mixture of a nitrate with brucine. A similar reaction is given on heating, although less readily, by acetic, propionic, butyric, and valeric acids. The reaction is regarded as an instance of the limitation of the principle of maximum work. N. L.

The Standard of Atomic Weights. By HUGO ERDMANN (*Zeit. anorg. Chem.*, 1901, 27, 127—137. Compare this vol., ii, 231).—A polemical article in reply to Brauner, in which the author supports as standard $H=1$. Out of 129 replies to the circular addressed to the university teachers in Germany, Austria, and Switzerland, 105 were in favour of $H=1$, whilst only 20 supported $O=16$. J. McC.

Report of the [American] Committee on Atomic Weights. By FRANK W. CLARKE (*J. Amer. Chem. Soc.*, 1901, 23, 90—95).—A résumé of the work published during 1900 on the atomic weights of nitrogen, iron, calcium, gadolinium, thorium, yttrium, samarium, helium, neon, argon, krypton, xenon, and radium; a corrected table of the atomic weights of all the elements is appended. E. G.

Simple Reflux Apparatus. By PAUL CAZENEUVE (*Bull. Soc. Chim.*, 1901, [iii], 25, 476—479).—A flask of cold water, or a Wurtz flask through which water circulates, placed in a funnel fixed in the cork of the distilling flask forms a cheap reflux apparatus in which caoutchouc joints and the risk of loss by spirting are avoided. In the case of very volatile liquids, the funnel is fitted into a long-necked bulb tube surrounded by a spiral of lead tubing through which water circulates. Illustrations of the apparatus are given in the paper. N. L.

Inorganic Chemistry.

Liquefaction of Hydrogen. By MORRIS W. TRAVERS (*Phil. Mag.*, 1901, [vi], 1, 411—423).—A description of the apparatus employed for the production of the liquid hydrogen which has been used by Ramsay and the author (this vol., ii, 237) in the separation of neon and helium. The author's "experiments differ neither in principle nor in conclusions from those of Dewar," but they "show that the production of liquid hydrogen is neither so difficult nor so costly as might have been expected." J. C. P.

Electrolytic Preparation of Alkali Periodates. By ERICH MÜLLER (Dresden) (*Zeit. Elektrochem*, 1901, 7, 509—516).—When a neutral solution of an alkali iodate is electrolysed with platinum electrodes and without a diaphragm, the gas which is at first evolved consists mainly of oxygen, the hydrogen having been employed in reducing iodate to iodide. As the latter accumulates in the solution, it is oxidised at the anode to iodate and the quantity of oxygen evolved also diminishes until finally very little gas is liberated and the solution contains a mixture of iodate and iodide of practically constant composition. In presence of a little potassium chromate practically no reduction occurs; there is also no formation of periodate. In alkaline solutions, however, a considerable yield of periodate is obtained. A series of experiments shows that the most favourable conditions are: low temperature, low current density, and the presence of at least 4 per cent. of sodium or potassium hydroxide. The solution of iodate should be as concentrated as possible and a diaphragm should be present. Sodium periodate separates out as a voluminous powder having approximately the composition $4\text{Na}_3\text{IO}_5 \cdot 5\text{H}_2\text{O}$; the potassium salt obtained is KIO_4 .

Lithium iodide in presence of a little chromate is oxidised to iodate electrolytically by a current of 0.13 amp. per sq. cm. at the anode and 0.59 ampere per sq. cm. at the cathode, the current efficiency being about 94.7 per cent. The iodate could not be further oxidised to periodate, however.

T. E.

Determination of the Molecular Weight of Ozone by means of the Balance. By MARIUS OTTO (*Ber.*, 1901, 34, 1118—1119).—The work of Ladenburg (this vol., ii, 232) on this subject has been anticipated by the author (*Abstr.*, 1897, ii, 207).

T. H. P.

Sulphur Trioxide. By RUDOLF SCHENCK (*Annalen*, 1901, 316, 1—17).—The coefficients of expansion of sulphur trioxide determined between the following temperatures 11° , 35.3° , 60.4° , 78.3° , 80.3° , and 100° are 0.0023, 0.0030, 0.0031, 0.0028, and 0.0028 respectively; the critical temperature of the compound is 216° . The existence of polymeric molecules in liquid sulphur trioxide is indicated by a determination of the molecular surface energy after the method introduced by Ramsay and Shields (*Trans.*, 1893, 63, 1089). The coefficient k determined by this process increases as the temperature rises, the values obtained being 1.35 at 17.5 — 35.3° , 1.62 at 35.3 — 60.4° , 1.86 at 60.4 — 78.3° , and 2.30 at 78.3 — 100° . The critical point calculated from the surface tension equation after applying Ramsay and Young's correction is found to be 214.6° . The existence of polymeric molecules in liquid sulphur trioxide supports the view that the asbestos-like form of the solid substance is a polymeric form of the prismatic modification and not a hydrate produced by the action of traces of moisture or sulphuric acid.

G. T. M.

Permonosulphuric Acid (Caro's Acid). By ADOLF VON BAEYER and VICTOR VILLIGER (*Ber.*, 1901, 34, 853—862).—A solution of Caro's acid prepared by acting on potassium persulphate, $\text{K}_2\text{S}_2\text{O}_8$, with sulphuric acid, pouring on to ice and diluting, is completely decom-

posed by the addition of baryta, but can be freed from sulphuric acid by precipitating with barium phosphate. The active oxygen and sulphur in the solution were found to be in the ratio $O : SO_3 = 1 : 1.156$, and it is therefore supposed that the solution consists mainly of salts derived from permonosulphuric acid, H_2SO_5 [$O : SO_3 = 1 : 1$], the excess of sulphur being accounted for by the presence in the solution of salts of unchanged perdisulphuric acid, $H_2S_2O_8$ [$O : SO_3 = 1 : 2$]. These two acids can be estimated separately by making use of the fact that the former acid causes an immediate separation of iodine from an acid solution of potassium iodide, whilst the latter acid acts only very slowly.

A solution of perdisulphuric acid, $H_2S_2O_8$, prepared by the action of dilute sulphuric acid on the barium salt, was found to decompose very slowly into sulphuric acid and permonosulphuric acid; in presence of 40 per cent. sulphuric acid, the conversion was almost complete in seven days, but hydrolysis of the acids to hydrogen peroxide also took place.

The anode acid in the electrolysis of 20 per cent. sulphuric acid was found to contain a relatively large proportion of perdisulphuric acid, which gradually changed into permonosulphuric acid; on electrolysing stronger acids, the change of the perdisulphuric acid into permonosulphuric acid and into hydrogen peroxide was found to have taken place already to a very large extent during the electrolysis.

T. M. L.

Inorganic Acids. By ARTURO MIOLATI and E. MASCETTI (*Gazzetta*, 1901, 31, i, 93—139).—The neutralisation of an acid by a base may be studied by adding successive proportions of base to the solution of the acid and determining the electrical conductivity of the liquid after each addition (compare Miolati, *Abstr.*, 1900, ii, 214). This method has now been applied to the following acids: sulphurous, selenious, selenic, telluric, chromic, arsenic, phosphorous, arsenious, boric, iodic, and periodic, the alkalis employed being sodium and potassium hydroxides and ammonia. The numerical results, which are given in tables and conductivity curves plotted therefrom for each acid, show that a number of the acids examined behave quite analogously to the dibasic acid existing in aqueous solutions of platinic chloride (*loc. cit.*). This anomalous behaviour is exhibited by all those acids which have several replaceable hydrogen atoms possessing different acidic properties. The basicity of such acids varies with the indicator employed in their titration; some of them are monobasic with methyl-orange whilst with phenolphthalein they are dibasic except in the presence of glycerol when certain of them are again monobasic. For the hydrogen metallic salts of some of these acids, the assumption of a double molecule is necessary to explain the change of conductivity on progressive neutralisation of the acids, whilst in some cases it is possible that such double molecules are partially dissociated into single molecules, as is notably the case with the dichromates.

T. H. P.

New Researches on Nitrohydroxylaminic Acid. By ANGELO ANGELI and FRANCESCO ANGELICO (*Atti Real. Accad. Lincei*, 1901, [v], 10, i, 249—255. Compare *Abstr.*, 1900, ii, 594).—*Silver nitrohydroxyl-*

amine may be obtained as a voluminous, yellow precipitate resembling silver hyponitrite or lead iodide, by the addition of a silver nitrate solution to a solution of the sodium salt acidified with acetic acid, the mixture being well cooled in a mixture of ice and salt; it is very unstable, and on removal from the cooling mixture rapidly decomposes for the most part in the sense of the equation $\text{NOAg}:\text{NO}_2\text{Ag} = \text{NO}_2\text{Ag} + \text{NO} + \text{Ag}$, the deposited silver having a shining, metallic appearance resembling that of ammonium amalgam.

Nitrohydroxylaminic acid reacts readily with glyoxal or suberaldehyde, yielding hydroxamic acids, which may be separated by means of their insoluble copper salts; in this reaction, the aldehydes behave like alcohols of the form, $\text{:CR}\cdot\text{OH}$.

With glyceraldehyde, nitrohydroxylaminic acid readily reacts, but not with dextrose or lactose, a fact which goes to support other evidence indicating that these sugars do not contain aldehyde residues, but have the structure of anhydrides. No action takes place with *o*-nitrobenzaldehyde or salicylaldehyde, helicin, metallic opianates, or pyrrolealdehyde.

The author goes on to discuss the six different ways in which nitrohydroxylaminic acid or its salts decompose, which are as follows: (1) $\text{H}_2\text{N}_2\text{O}_3 = 2\text{NO} + \text{H}_2\text{O}$; (2) $\text{H}_2\text{N}_2\text{O}_3 = \text{HNO}_2 + \text{NOH}$; (3) $\text{H}_2\text{N}_2\text{O}_3 = \text{HNO}_2 + \text{NO} + \text{H}$; (4) $\text{H}_2\text{N}_2\text{O}_3 + \text{H}_2\text{O} = \text{NH}_2\cdot\text{OH} + \text{HNO}_2 + \text{O}$; (5) $2\text{H}_2\text{N}_2\text{O}_3 = 2\text{HNO}_2 + (\text{NOH})_2$; (6) $2\text{H}_2\text{N}_2\text{O}_3 = 2\text{HNO}_2 + \text{N}_2\text{O} + \text{H}_2\text{O}$.

T. H. P.

Action of Hydrogen Arsenide on Boron Bromide. By ALFRED STOCK (*Ber.*, 1901, 34, 949—956. Compare Besson, *Abstr.*, 1890, 448, 690, and 1891, 1418).—The additive compound $\text{BBr}_3\cdot\text{AsH}_3$, is obtained when boron bromide is gradually dropped into liquefied hydrogen arsenide contained in a special apparatus and maintained at a temperature of -80° to -100° . It is essential that all moisture and oxygen be previously removed, and the operation is best carried out while a stream of perfectly dry hydrogen is passed through the apparatus. The product is a white, amorphous substance which, when heated, decomposes, but does not melt. It may be obtained in a crystalline form by careful sublimation in a closed vessel. It is insoluble in carbon disulphide, but dissolves in either of its constituents. In contact with air or oxygen, it is readily oxidised, and in most cases is spontaneously inflammable, yielding boric and arsenious oxides, and hydrogen bromide. It is not acted on by oxygen at temperatures below -40° . If the amount of oxygen is carefully regulated and the temperature kept moderately low, the products are boric oxide, hydrogen bromide, and free arsenic, together with arsenic tribromide.

Even at 0° , slow decomposition into its constituents occurs, and this is accelerated if a current of some indifferent gas is employed to remove the hydrogen arsenide as it is formed; a small amount of arsenic is also deposited. When kept for several weeks at the ordinary temperature in a closed vessel protected from light, it is completely decomposed into boron bromide, arsenic, and hydrogen. In contact with water, it is decomposed into boric acid, hydrogen bromide, hydrogen arsenide, and a small amount of free arsenic. Concentrated

sulphuric acid has no apparent action, but concentrated nitric acid produces violent oxidation. Arsenic trichloride reacts with the compound, even at -50° . Ammonia at 10° yields the compound $2\text{BBr}_3 \cdot 9\text{NH}_3$. J. J. S.

The Reversible Reaction $\text{CO}_2 + \text{H}_2 \rightleftharpoons \text{CO} + \text{H}_2\text{O}$. By OCTAVE BOUDOUARD (*Bull. Soc. Chim.*, 1901, [iii], 25, 484—489).—A mixture of equal volumes of dry carbon dioxide and hydrogen was heated in a porcelain vessel at 850° and 1100° , and an analysis made at the end of each experiment of the mixture of carbon dioxide, carbon monoxide, hydrogen, and aqueous vapour produced. The results obtained are in fair accordance with Le Chatelier's formula (*Abstr.*, 1900, ii, 199) for the equilibrium of gaseous mixtures, the differences observed being probably due to the condensation of water in the cold portion of the porcelain vessel and, at the higher temperature, to the passage of hydrogen through the walls of the porcelain vessel. The pressure has no influence on the equilibrium, since the numbers of reacting and produced molecules are equal. The reaction is of interest in connection with the manufacture of air and water gas. N. L.

New Researches on the Action of Hydrogen Peroxide on Silver Oxide. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1901, 132, 897—904).—New experiments confirm the author's earlier conclusions (*Abstr.*, 1880, 441; 1899, ii, 149) that the action of hydrogen peroxide on precipitated silver oxide results in the formation of silver peroxide, Ag_2O_2 , part of which decomposes into silver and oxygen, and part into silver oxide and oxygen, whilst a third part combines with the silver oxide so produced and forms an intermediate oxide, Ag_4O_3 . The latter decomposes into silver oxide and oxygen. There are three distinctly recognisable stages in the reaction, but they are not very sharply defined. If the decomposition is rapid and there are sudden local elevations of temperature, the silver peroxide tends to decompose completely into silver and oxygen. C. H. B.

Theory of Technical Processes. By GUIDO BODLÄNDER and P. BREULL (*Zeit. angew. Chem.*, 1901, 14, 381—390, and 405—413).—In the ammonia-soda process, sodium chloride, carbon dioxide, calcium carbonate, and water yield calcium chloride and sodium hydrogen carbonate. The reverse change takes place when solutions of sodium hydrogen carbonate and calcium chloride are mixed. It is shown, however, that the reaction represented by the equation $\text{HCl} + \text{NaHCO}_3 \text{ (solid)} = \text{CO}_2 + \text{H}_2\text{O} + \text{NaCl (solid)}$ is accompanied by an absorption of heat amounting to 4020 cal. From the known dissociation of carbonic acid into the ions HCO_3 and H , and their solubility in water and the solubility of sodium hydrogen carbonate in solutions of sodium chloride, the authors have calculated the pressure under which carbon dioxide must be forced into a saturated solution of sodium chloride in order to bring about the reverse change and cause the separation of sodium hydrogen carbonate. This pressure is 3.3 million atmospheres.

From this pressure, the mechanical work required to bring about the reverse change can be calculated; for gram-molecular proportions, it amounts to 3.894×10^8 gr. cm.

By determining the *E.M.F.* of a galvanic element,
 Platinum | $\text{H} + \text{CO}_2$ | $\text{HCl}(0.12N) + \text{saturated NaCl aq.}$ | solution of
 $\text{NaCl} + \text{NaHCO}_3$ (saturated for each) | $\text{H} + \text{CO}_2$ | Platinum,
 the electric energy of the reaction between hydrochloric acid and sodium
 hydrogen carbonate can be estimated; for a pressure of carbon dioxide
 of $\frac{1}{2}$ atmosphere, the electric energy is 38180 Joule = 3.894×10^8 gr.
 cm. Thus, although the chemical reaction is accompanied by an
 absorption of heat, free energy is developed. The temperature coeffi-
 cient of the *E.M.F.*, calculated from the heat change and the electro-
 motive force, is 0.001935, which agrees with the experimental value
 0.00205.

The solubility of sodium hydrogen carbonate in solutions of sodium
 chloride is measured, and agrees very well with the values calculated
 from the law of lowering of solubility (Nernst) for low concentrations
 of sodium chloride. With high concentrations, the experimental
 lowering of solubility is found to be far greater than the calculated
 values.
 K. J. P. O.

Spontaneous Crystallisation of the Hydrate $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
 from Saturated Solutions of Sodium Sulphate. Limit of the
 Metastable State in these Solutions. By LOUIS C. DE COPPET
 (*Bull. Soc. Chim.*, 1901, [iii], 25, 388—393).—When a saturated solu-
 tion of sodium sulphate is sufficiently cooled, spontaneous crystallisa-
 tion always occurs, even under conditions which preclude the access
 of crystalline nuclei from the atmosphere, and it was shown by the
 author, in 1872, that this takes place between such wide limits of
 temperature as from -13° to $+6^\circ$. More recent observations, details
 of which are given in the paper, show that the formation of the hydrate
 $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ frequently occurs at 8.5° , and has once been observed
 to take place at about 12° . The results are in accord with the con-
 clusions formerly arrived at (*Ann. Chim. Phys.*, 1875, [v], 6, 275), that
 the time required for the spontaneous crystallisation of a supersatur-
 ated solution decreases as the temperature decreases and the concen-
 tration increases. No precise distinction can be drawn between the
 two conditions, termed by Ostwald the metastable state, in which the
 presence of a crystalline nucleus is required for crystallisation, and
 the labile state, in which crystallisation may occur spontaneously.

N. L.

Decomposition of Ammonium Nitrite. By RUDOLF WEG-
 SCHEIDER (*Zeit. physikal. Chem.*, 1901, 36, 543—545).—Owing to the
 fact that the decomposition of ammonium nitrite solutions is accelerated
 by the addition of a salt having a common ion, Angeli and Boeris
 (Abstr., 1893, ii, 155) considered the reaction to be due to the undis-
 sociated molecules, but the author points out that the above facts equally
 support the view that the reaction takes place between the two ions.

L. M. J.

Crystallised Calcium Oxide. By ADOLPHE JOUVE (*Compt. rend.*,
 1901, 132, 1117—1118).—When calcium chloride and carbon are
 heated in an electric furnace under such conditions that the formation
 of calcium carbide is incomplete, a small quantity of calcium oxide is

usually obtained in the form of transparent, acicular prisms of sp. gr. 2.5.
C. H. B.

Calcium Sulpho-aluminates and the Decomposition of Maritime Structures made of Portland Cement. By ORAZIO REBUFFAT (*Gazzetta*, 1901, 31, i, 55—57).—The author describes a series of experiments on the action of solutions of magnesium salts and sodium chloride, and of sea-water on calcium sulpho-aluminates, aluminates, and silicates. The results show that the formation of sulpho-aluminates in cement immersed in sea-water is only transitory, and only takes place to a very slight extent, so that the disgregation of the cement cannot be due to this action. Further, sodium chloride has a disintegrating action on the aluminates and on the sulpho-aluminates. T. H. P.

Barium Hydride. By ANTOINE GUNTZ (*Compt. rend.*, 1901, 132, 963—966).—Barium hydride, BaH_2 , a compound whose existence was first indicated by Winkler (*Abstr.*, 1890, 452), is prepared by heating barium amalgam, contained in an iron boat at 1400° in a current of hydrogen; it forms a grey, crystalline mass, having a sp. gr. 4.21 at 0° . The compound melts at 1200° and at 1400° in a current of hydrogen, slowly volatilises without decomposition yielding a green vapour; it is decomposed by water, giving rise to barium hydroxide and hydrogen. When heated in nitrogen, it evolves hydrogen and becomes converted into the corresponding nitride, Ba_3N_2 , the latter compound being contaminated with a large amount of the iron nitride, Fe_3N_2 , produced under these conditions by the interaction of nitrogen and the material of the iron boat. These two nitrides are isomorphous, for the mixture is homogeneous and well crystallised. The amount of the iron compound produced increases with the temperature, and a similar phenomenon is observed when lithium nitride is prepared in an iron or nickel vessel.
G. T. M.

Radioactive Lead. By KARL A. HOFMANN and EDUARD STRAUSS (*Ber.*, 1901, 34, 907—913. See this vol., ii, 19, 216).—Continuing their researches on the “pure lead sulphate,” isolated from bröggerite, the authors have separated two “elements,” of which the probable atomic weights are 100.92 and 171.96. The first of these forms a yellow sulphate, and has little influence on the radioactivity of the “lead.” The strong radioactivity of the sulphate of the other “element” is lost when it is converted into the sulphide, but returns when the sulphide is reconverted into the sulphate. The paper concludes with a discussion of the connection between radioactivity and phosphorescence, and between radioactivity and the Becquerel rays.
R. H. P.

Alloys made in the Electric Furnace. By LEWIS P. HAMILTON and EDGAR F. SMITH (*J. Amer. Chem. Soc.*, 1901, 23, 151—155).—The electric furnace employed consisted of two graphite crucibles, placed one within the other, the space between being filled with magnesia; it was provided with two carbon poles, of which the negative was inserted through the side of the crucible at about 3 cm. from the bottom. By means of this apparatus, the authors have prepared a number of alloys containing chiefly the following elements; copper, molybdenum, iron,

chromium, aluminium, tungsten, titanium, columbium, and tantalum. The analysis of each alloy is appended. E. G.

Slow Alteration in Copper Alloys in Contact with Air and Alkali Chlorides. By MARCELLIN P. E. BERTHELOT (*Ann. Chim. Phys.*, 1901, [vii], 22, 457—460. Compare *ibid.*, 1895, [vii], 4, 552).—Copper alloys, immersed in a sodium chloride solution in contact with air, are slowly disintegrated the copper being converted into the basic chloride, $3\text{CuO} \cdot \text{CuCl}_2 \cdot 4\text{H}_2\text{O}$, corresponding with atacamite; this salt reacts with a further quantity of copper, giving rise to cuprous oxide and sodium cuprous chloride, the latter compound being reconverted into the basic salt by atmospheric oxidation. The other metals of the alloy are also oxidised, and are found partly precipitated and partly in solution. Antique objects now composed of copper oxide were in all probability originally made of some copper alloy, and owe their present composition to the preceding reactions, the oxygen replacing the other constituents of the alloy without altering their contours. G. T. M.

Presence of Acid Sulphate of Copper in Mixtures of Aqueous Solutions of Sulphuric Acid and Copper Sulphate. By CHARLES F. LINDSAY (*Trans. Nov. Scot. Inst. Sci.*, 1900, 10, 205—210).—The amount of alkali required to cause precipitation of copper hydroxide agrees with that necessary for the neutralisation of the sulphuric acid known to be present. There is thus no evidence of the existence of copper hydrogen sulphate in the solution. The specific gravity of the mixture is less than the mean value for the specific gravities of the sulphuric acid and copper sulphate solutions, which agrees with Favre and Valson's observations (*Compt. rend.*, 1873, 77, 907) on mixtures of copper and potassium sulphates. J. McC.

Behaviour of Fluorides of the heavy Metals in Solution. By A. JAEGER (*Zeit. anorg. Chem.*, 1901, 27, 22—40).—Mercuric fluoride is hydrolysed in solution to the extent of about 80 per cent., and this hydrolysis is evidence for the formula H_2F_2 for hydrofluoric acid. Cupric fluoride is hydrolysed to a much less extent. The solubility of mercuric oxide and cupric oxide in hydrofluoric acid is decreased by the addition of potassium fluoride, which proves the non-existence of complex fluorides.

Cadmium fluoride is soluble to the amount of 0.3 gram-mol. in 1000 c.c. of water, and slightly more soluble in hydrofluoric acid.

Lead fluoride is very slightly soluble in dilute hydrofluoric acid, but insoluble in stronger acid. Lead hydroxide decomposes the alkali haloids until equilibrium is obtained with the free alkali, depending on the solubility of the lead haloids; it also appears to form complex compounds with the lead haloids. E. C. R.

Mercury Iodoantimonide. By ALBERT GRANGER (*Compt. rend.*, 1901, 132, 1115—1116).—Mercury iodoantimonide, $\text{Hg}_3\text{Sb}_4 \cdot 2\text{HgI}_2$, is obtained in grey, lustrous, brittle, prismatic crystals by heating mercury at 300° in sealed tubes with a slight excess of antimony triiodide, and removing mercuric iodide from the product by treatment with a strong solution of sodium sulphite. When heated, the iodoantimonide is decomposed into mercuric iodide, mercury, and anti-

mony; it is readily attacked by chlorine, bromine, nitric acid, and hot sulphuric acid, but not by hydrochloric acid. It is also decomposed by a warm solution of ferric chloride, and is reduced by zinc and dilute sulphuric acid, especially on heating.

C. H. B.

Praseodymium. By CARL VON SCHÉELE (*Zeit. anorg. Chem.*, 1901, 27, 53—57).—A criticism of Muthmann's work (*Abstr.*, 1900, ii, 18). A spectroscopic examination of the praseodymium oxide employed in the author's previous work shows that it is free from lanthanum.

E. C. R.

Zirconium Earth in Euxenite from Brevig. By KARL A. HOFMANN and W. PRANDTL (*Ber.*, 1901, 34, 1064—1069).—In extracting the small quantities of lead from euxenite from Brevig (*Abstr.*, 1900, ii, 216; this vol., ii, 19), a zirconium earth was found in the residue of sulphates, the properties of which indicated the presence of the oxide of an unknown metal. The separation of the latter compound from the zirconia is described.

The oxide, which the authors term provisionally 'euxenium earth,' is white, and, after ignition, is only sparingly soluble in acids. When fused with sodium hydrogen sulphate, treated with sulphuric acid, and evaporated to dryness, a residue is obtained which yields a colourless solution. On the addition of an alkali to the solution, a white, flocculent precipitate is produced which is insoluble in excess. With hydrogen peroxide, a white precipitate is gradually formed. Oxalic acid yields no precipitate. If a solution of the chloride is treated with zinc and hydrochloric acid, no coloration is produced. When tannic acid is added to a faintly acid solution, a yellowish-brown precipitate is obtained. Potassium ferrocyanide gives, after a few minutes, a brown precipitate. The oxide differs from that of zirconium in yielding a precipitate with excess of ammonium carbonate and in giving no coloration with turmeric. Determinations of the equivalent by means of the sulphate gave 44·4—44·5, whence the atomic weight calculated for a quadrivalent element would be 177·6—178.

In addition to the 'euxenium earth,' small quantities of another unknown substance are present, which furnishes a yellow chloride; its solutions yield a brownish-yellow precipitate with potassium ferrocyanide, and are reduced by zinc and hydrochloric acid with production of a greenish-brown coloration; it is perhaps related to tantalum, but possesses a pronounced basic character.

Analyses of specimens of euxenite (I) from Arendal and (II) from Brevig gave the following results:

	Loss on Ignition.	SiO ₂ .	TiO ₂ .	Nb ₂ O ₅ .	PbO.	Ytterbium and Cerium oxides.
I.	1·91	0·19	17·35	33·56	1·07	35·34
II.	2·06	20·94	20·72	10·79	0·43	21·90
	U ₃ O ₈ .	ZrO ₂ .	Fe ₂ O ₃ .	Al ₂ O ₃ .	CaO.	Total.
I.	4·37	1·30	1·58	3·71	—	100·28
II.	2·93	1·97	9·27	9·22	0·67	100·90

The constituent of the euxenite from Brevig calculated as zirconia

contained 'euxenium earth' to the extent of about one-half of its weight.

E. G.

Heat of Rapid Combustion of Aluminium. By MARCELLIN P. F. BERTHELOT (*Ann. Chim. Phys.*, 1901, 22, [vii], 479—482).—The heat of combustion of aluminium has hitherto been determined indirectly, as it is not readily burnt in a calorimeter even with compressed oxygen in the presence of camphor. A mixture of aluminium, aluminium carbide, camphor, and gun-cotton can, however, be completely oxidised, and the heat of formation of aluminium oxide deduced from this experiment is 380.2 Cal., that of the hydrated substance being 393.0 Cal.

G. T. M.

Aluminium Alloys: Combination of Aluminium and Tungsten. By LÉON GUILLET (*Compt. rend.*, 1901, 132, 1112—1115).—An intimate mixture of tungstic anhydride with finely divided aluminium was placed in a crucible brasqued with magnesium oxide, and ignited by means of a mixture of barium peroxide and aluminium, when a somewhat violent combustion occurs. In this way, crystallised alloys of tungsten and aluminium are obtained, the composition of which depends on that of the original mixture. If the latter is between that required to produce theoretically AlW_{10} and Al_5W respectively, the product is AlW_2 ; if between AlW and $Al_{10}W$, the product is Al_4W ; if between Al_3W and AlW_5 , the product is Al_3W .

In analysing the alloys AlW_2 and Al_3W , sodium peroxide was found to be the best reagent for attacking them, as they are but little soluble in aqua regia, which, however, readily dissolves the alloy Al_4W .

C. H. B.

Action of Heat on Potassium Permanganate. By GEORGE RUDORF (*Zeit. anorg. Chem.*, 1901, 27, 58—61).—When potassium permanganate is heated over a bunsen burner the decomposition which takes place may be represented by the equation $10KMnO_4 = 3K_2MnO_4 + 7MnO_2 + 6O_2 + 2K_2O$, or there are formed 12.14 per cent. oxygen, 37.42 per cent. potassium manganate and 38.51 per cent. manganese dioxide.

E. C. R.

Rate of Dissolution of Iron in Hydrochloric Acid. By JAMES T. CONROY (*J. Soc. Chem. Ind.*, 1901, 20, 316—320).—When iron dissolves in hydrochloric acid, the rate of dissolution is initially slow during the "period of induction" (Spring and Van Aubel, *Abstr.*, 1887, 1074), then attains a maximum value, and afterwards diminishes; in the following statements, the term "rate of action" refers to the *maximum* rate of action, this being determined by measuring the maximum rate at which hydrogen is evolved from thin plates of iron of equal area immersed in acid of different concentrations and at different temperatures. Curves are given showing the influence of these conditions on the rate of dissolution; as the concentration increases the rate of action increases in geometrical progression over "a considerable range," in such manner that the rate of dissolution is doubled for each increase of 30 grams of hydrogen chloride per litre. A similar law connects the rate of dissolution and temperature, the former being doubled for each 10° rise of the latter for concentrations between 25 and 216 grams of hydrogen chloride per litre.

When traces of arsenic are present in the acid used, the rate of dissolution is considerably diminished; when present in larger quantities, the iron becomes completely covered with a film of arsenic, and action almost completely ceases, even in the case of the more concentrated acids.

W. A. D.

Oxides of Cobalt. By ERWIN HÜTTNER (*Zeit. anorg. Chem.*, 1901, 27, 81—124).—Cobalt sulphate when oxidised by means of (a) potassium persulphate in alkaline solution, (b) ammonium persulphate in acid solution, (c) ammonium persulphate in alkaline solution, or (d) chlorine gas, yields only the cobaltic oxide Co_2O_3 . The state of hydration of the precipitated oxide depends on conditions which have not been ascertained and the various products obtained were: $\text{Co}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$; $2\text{Co}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$; and $3\text{Co}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$.

When oxidised by sodium hypochlorite, a product is obtained which contains more oxygen than Co_2O_3 and corresponds approximately with $\text{Co}_{12}\text{O}_{19}$. An alkaline solution of potassium cobalt sulphate, when oxidised with excess of iodine, gives a black precipitate of CoO_2 . If less iodine be used, a less highly oxidised compound is obtained. The electrolysis of a solution containing cobalt sulphate and a large amount of potassium chloride yields the same oxide, namely, Co_2O_3 , as oxidation by means of chlorine. It is therefore only by the direct application of hypochlorite that a higher state of oxidation than that represented by Co_2O_3 is reached.

Coehn and Salomon (Abstr., 1899, ii, 127) have suggested that a separation of cobalt and nickel may be carried out by electrolytically depositing cobalt superoxide at the anode. The author finds that on electrolysing a neutral solution of cobalt sulphate, a precipitate is formed at the anode but is quickly redissolved (by the acid liberated). To prevent this re-solution the whole was kept continually neutral by the gradual addition of sodium carbonate, and the precipitate so formed was found to be Co_2O_3 . Coehn's surmise of the production of the superoxide is consequently not confirmed.

J. McC.

Some Cobalt Reactions. By EDUARD DONATH (*Zeit. anal. Chem.*, 1901, 40, 137—141).—The majority of text-books ignore the solubility of cobaltous hydroxide in concentrated alkali hydroxide solutions (see, however, Reichel, Abstr., 1881, 194; also 1893, ii, 468). On adding either a soluble or insoluble cobalt salt, or any cobalt ore after roasting, to a hot 80 per cent. solution of potassium hydroxide, a blue solution is obtained. Cupric oxide gives a similar blue solution under the same conditions. The two can be distinguished as follows: addition of an alkali tartrate somewhat deepens the colour of the copper solution but nearly decolorises that of cobalt, leaving very strong solutions slightly reddish; addition of potassium cyanide decolorises the copper solution completely, but leaves the cobalt solution yellowish, and this yellow solution, when in contact with air, rapidly acquires a deep brown colour. Whilst with aqueous alkali solutions the cobalt compound added is never wholly redissolved, a mixture containing glycerol gives no precipitate with a cobalt salt, either in the cold or on boiling. The blue solution produced in this case becomes green by absorption of oxygen or by addition of hydrogen

peroxide. The author suggests that the blue solution contains potassium cobaltite, $\text{Co}(\text{OK})_2$, in a non-ionised condition. M. J. S.

Uranium Nitrate and Sulphate. By WILLIAM OECHSNER DE CONINCK (*Bull. Acad. Roy. Belg.*, 1901, 3, 222—226. Compare this vol., ii, 104, 105, 164, 165).—Uranium nitrate crystals lose H_2O at 100° , the second mol. between 100° and 115° , and the third between 115° and 130° . On heating at 255° , they decompose, giving nitrogen peroxide and oxygen and leave a solid residue of uranium sesquioxide.

Solutions of uranium nitrate in hydrobromic acid solution (sp. gr. 1.21) have the following sp. gr. :

Temp.	16.8°.	15.2°.	17.4°.	14.7°.	15.3°.
Percentage of dissolved salt	1	2	3	4	5
Sp. gr. ($\text{H}_2\text{O} = 1$)	1.2122	1.2168	1.2198	1.2250	1.2305

The sp. heat of a 10 per cent. solution is 0.946. An 8 per cent. solution has $n. 1.338$, a 10 per cent. solution $n. 1.348$, and a 12 per cent. solution $n. 1.364$.

Uranium sulphate loses 1.5 H_2O at 100° and at 110 — 115° another 0.5 mol. is expelled. At 175° , the third mol. is driven off. At a dull red heat, the salt is decomposed and leaves a residue which consists of a mixture of the oxides U_2O_3 and U_3O_4 . Heated rapidly it gives a residue of the black oxide, U_4O_5 . J. McC.

Studies on Solutions of Stannous Salts. II. The Oxidation of Solutions of Stannous Chloride by means of Free Oxygen. By STEWART W. YOUNG (*J. Amer. Chem. Soc.*, 1901, 23, 119—147. Compare this vol., ii, 318).—A solution of stannous chloride was thoroughly shaken with pure oxygen in a flask by means of a specially devised apparatus; the decrease in the volume of the oxygen for definite periods of time was measured by means of a gas burette, the temperature being kept constant. The residual stannous chloride was titrated with solution of potassium dichromate.

It was found that the velocity constant increases considerably during the first thirty or forty minutes, but that if semi-normal hydrochloric acid is added to the solution this acceleration is much less marked; the values obtained vary greatly in different series of experiments, but for a given series in which the stannous chloride is of the same strength throughout, the increase is approximately proportional to the concentration of the hydrochloric acid. These facts find their simplest explanation in the supposition that the hydrochloric acid produced by the reaction tends to diminish the proportion of stannous chloride hydrolysed.

The rate of oxidation increases to a certain extent with the age of the solution; solutions kept for some time in previously exhausted sealed tubes, exhibited a rate of oxidation more than double that of a solution prepared in the flask immediately before the experiment. If a tube of the solution was opened and left for about 20 minutes in the air, different portions of the solution gave results in approximate agreement; but if the tube was not opened until immediately before an experiment, and the first portion introduced at once into the apparatus, this first portion invariably yielded higher results than succeed-

ing portions, whilst the results of the latter agreed fairly well with one another.

Experiments carried out in order to determine if re-exhaustion of the tube would remove the agent which caused the depression in the rate of oxidation showed that it had no apparent effect; light also has no appreciable influence on the reaction.

The reaction between stannous chloride and oxygen hence appears to be extremely sensitive to small quantities of substances with which the reagents may come in contact in the ordinary methods of manipulation; the influence of a number of such substances was therefore investigated. It was found that india-rubber, sulphur, hydrogen sulphide, salts of iron and copper, and alcohol cause an acceleration in the rate of oxidation, whilst salts of manganese and chromium, tobacco smoke and extract, brucine, morphine, nicotine, mannitol, aniline and potassium cyanide produce a retardation; pyridine and phenol do not exert any considerable influence. E. G.

Metathoric Acid and Metathorium Oxychloride. By HENRY P. STEVENS (*Zeit. anorg. Chem.*, 1901, 27, 41—62).—A repetition of Locke's work (*Abstr.*, 1895, ii, 49) shows that the formula of metathorium oxide is not Th_3O_5 but ThO_2 ; that is, it has the same composition as ordinary thorium oxide.

Metathorium oxide, prepared by heating the oxalate, when treated with dry hydrogen chloride, is converted into oxychloride which contains chlorine varying from 0.61 to 10 per cent., according to the amount of water contained in the metathorium oxide. Metathorium oxide, like silicic acid, retains water persistently, but when it is dried by heating in a current of dry air it is no longer acted on by hydrogen chloride. The reaction which takes place between the oxide containing water and chlorine corresponds with the formula $\text{ThO}_2 \cdot x\text{ThCl}_4$ for the oxychloride.

Metathorium oxychloride is a white, hygroscopic powder which dissolves in water to a clear solution when it contains 9 to 10 per cent. of chlorine; the preparations with less chlorine yield a more or less opalescent solution. It has an acid reaction, is insoluble in absolute alcohol, dissolves in alcohol containing a small quantity of water, behaves towards reagents in a similar manner to metastannic chloride, and is precipitated by many normal salts and by excess of acid, this precipitation taking place more easily the less chlorine it contains. When treated with silver nitrate, it does not give a precipitate of silver chloride.

Metathorium hydroxide, or metathoric acid, prepared by precipitating the oxychloride with ammonia, unlike thoric acid, does not absorb carbon dioxide from the air, and is less basic. It is gradually converted into thoric acid when allowed to remain in contact with water, and dissolves in mineral acids if an excess of acid is carefully avoided. When prepared from a metaoxychloride rich in chlorine, it requires more acid for solution than when prepared from a compound poor in chlorine, and a solution of metaoxychloride requires more acid to precipitate it as the percentage of chlorine increases. The author

points out the similarity between metathoric acid and metastannic acid.

E. C. R.

Rhodium Alums. The Separation of Rhodium from Iridium. By AUGUSTO PICCINI and L. MARINO (*Zeit. anorg. Chem.*, 1901, 27, 62—71).—Rhodium alums are obtained by mixing a sulphuric acid solution of yellow rhodium sesquioxide with the alkali sulphate, and allowing the mixture to crystallise. The conditions under which these alums are formed are, that only about two-thirds of the theoretical quantity of alkali sulphate and an excess of sulphuric acid are present, and that the solutions are not heated at too high a temperature.

Rhodium caesium alum, $\text{Rh}_2(\text{SO}_4)_3 \cdot \text{Cs}_2\text{SO}_4 \cdot 24\text{H}_2\text{O}$, is sparingly soluble in cold water, much more so in warm water, melts at $110\text{--}111^\circ$, and when dried at $180\text{--}250^\circ$ turns brown, with a loss of a small quantity of sulphuric acid, but is still completely soluble in water. The corresponding *rubidium*, *potassium*, *ammonium*, and *thallium* salts are described. These salts all form characteristic, transparent, regular crystals of a more or less deep yellow colour, and are more soluble than the ordinary alums.

Rhodium is easily separated from iridium by adding to a solution of the sulphates a solution of caesium sulphate; the rhodium caesium sulphate is, after recrystallisation, quite free from iridium. By subjecting the solution of the alum to electrolysis, the rhodium is easily obtained in a pure state, and the caesium sulphate which remains in solution can be employed for another precipitation of the alum.

E. C. R.

Mineralogical Chemistry.

Crystallised Stannite from Bolivia. By LEONARD J. SPENCER with analyses by GEORGE T. PRIOR (*Min. Mag.*, 1901, 13, 54—65).—At various times, no less than four types of symmetry have been ascribed to the rare and indistinct crystals of stannite, the one at present usually accepted being tetrahedral-cubic. The distinct crystals from Oruro, Bolivia, now described, are associated with mispickel, andorite, angelite, chalcostibite, jamesonite, pyrites, &c.; they are scalenohedral-tetragonal, with $(001):(101)=44^\circ30'$. Usually three crystals are twinned together on (101) and (011), giving rise to pseudo-tetrahedral-cubic groups. Twinning also takes place on (111), as in cubic crystals. The colour is iron-black, with a bright metallic to subadamantine lustre; streak, black. The mean of two analyses, which are the first that have been made on crystallised material, is given under I; under II is given the composition of the stannite after deducting 8.58 per cent. of admixed andorite. This agrees with the formula, $\text{Cu}_2\text{FeSnS}_4$, usually given for the mineral.

	Cu.	Fe.	Sn.	Sb.	Pb.	Ag.	S.	Total.	Sp.gr
I.	28.56	10.93	25.21	3.71	2.06	0.88	27.83	99.18	—
II.	31.52	12.06	27.83	28.59	—	—	—	100.00	4.45

In the symmetry, peculiar twin-laws, and angles, stannite, ($\text{CuFeS}_2, \text{CuSnS}_2$), is crystallographically almost identical with copper pyrites (CuFeS_2). Indistinct crystals of stannite are described from two other Bolivian localities and from Cornwall. L. J. S.

Melonite. By ARTHUR DIESELDORFF (*Centr. Min.*, 1901, 168—170).—The following is the mean of three new analyses by P. Georgi of selected melonite from Worturpa, South Australia (compare Abstr., 1900, ii, 283, 664). Sp. gr. 7.36. There is about 3 per cent. of selenium.

Te(Se).	Ni.	Co.	Fe.	Al.	Bi.	Ag.	Au.	Ca.	Total.
80.17	16.73	0.75	1.33	0.29	0.04	0.08	0.32	0.12	99.83

These results agree with the formula NiTe_3 , in which the nickel is partly replaced by iron and cobalt, and the tellurium by selenium.

This formula, NiTe_3 , in place of the old formula Ni_2Te_3 , has already been given by Hillebrand for Californian melonite (Abstr., 1900, ii, 22). The mineral is sometimes found as six-sided plates with a perfect cleavage parallel to the plane of the plate; for this reason it may belong to the sylvanite group. L. J. S.

Tellurides of Gold and Silver from Western Australia. By P. KRUSCH (*Centr. Min.*, 1901, 199—202).—The tellurides of the Coolgardie gold-field occur as veins in a schistose amphibolite; the upper, oxidised portions of the veins carry free gold. Sylvanite (compare Abstr., 1897, ii, 503), of a silver-white colour and with a perfect cleavage in one direction, gave analysis I, by Wölbling, agreeing with formula $(\text{Au}, \text{Ag})\text{Te}_2$. Calaverite (compare Abstr., 1898, ii, 385), of a pale bronze-yellow colour with a yellowish-grey streak and conchoidal fracture, gave II; formula $(\text{Au}, \text{Ag})\text{Te}_2$. Petzite, steel-grey to iron-black with conchoidal fracture, gave III; formula $(\text{Ag}, \text{Au})_2\text{Te}$; this occurs very abundantly. Another mineral, differing somewhat from petzite in appearance, is almost blue-grey and has indications of a cleavage: this gave the results under IV (contains also Sb 0.12, Zn 0.04); formula $(\text{Ag}, \text{Au})_5\text{Te}_3$.

	Au.	Ag.	Cu.	Fe.	Ni.	Te.	Se.	S.	Gangue.	Total.
I.	28.55	9.76	0.32	0.06	0.10	60.83	0.20	0.09	0.05	99.96
II.	37.54	2.06	0.29	0.09	0.07	58.63	1.13	0.10	0.23	100.14
III.	24.33	40.70	0.10	0.07	0.08	32.60	1.45	0.26	0.12	99.71
IV.	15.06	45.95	1.16	0.08	0.06	36.90	—	0.45	0.22	100.04

Associated with these tellurides, and somewhat resembling them in appearance, is a copper ore which gave the following results on analysis; the atomic ratios $\text{Cu}(\text{ZnFe}) : \text{As}(\text{Sb}) : \text{S} = 78 : 27 : 90$, approach those of enargite (Cu_3AsS_4).

Cu.	Ag.	Au.	Fe.	Zn.	Ni.	Pb.	S.	As.	Sb.	Te.	Gangue.
41.69	0.22	0.12	4.73	2.68	0.15	0.10	28.43	16.87	4.30	0.05	0.26

L. J. S.

Quartz and Gelatinous Silicic Acid from the Simplon Tunnel. By GIORGIO SPEZIA (*Zeit. Kryst. Min.*, 1901, 34, 289—290; from *Atti R. Accad. Sci. Torino*, 1899, 34, 705—713).—A crevice 10 cm. wide in the gneiss of the Simplon Tunnel is filled with a gelatinous

substance resembling vaselin in appearance. Embedded in this are numerous extremely minute quartz crystals, small rhombohedra of ankerite, and a few crystals of pyrites and scales of mica. The ankerite has the composition, CaCO_3 , 59.55 ; MgCO_3 , 20.90 ; FeCO_3 , 19.55 = 100.00. The gelatinous substance loses water on exposure to the air, and about 48 per cent. at 100° ; at a red heat there is a further loss of 4.4 per cent. The calcined material contains 93 per cent. of silica. The substance is only slightly soluble in warm potassium hydroxide, and the insoluble portion is not affected by hydrochloric acid or by hot concentrated sulphuric acid. This residue has the composition, SiO_2 , 57.53 ; Al_2O_3 , with a trace of Fe_2O_3 , 38.02 ; CaO , MgO , 4.45 = 100.00. It is, therefore concluded that the substance is a mechanical mixture of silicic acid and aluminium hydroxide, both in a colloidal condition. The resistance of the aluminium hydroxide to acids and alkalis is explained by it having remained for a long period in contact with water. Gelatinous silicic acid which has been in contact with water for several years is also not immediately dissolved by potassium hydroxide ; and that now described from the Simplon Tunnel probably represents a stage in the passage to quartz.

L. J. S.

Analysis of Limonite from Monte Valerio. By E. MANASSE (*Proc. verb. Soc. Toscana Sci. Nat.*, 1899, 12, 21—22).—Analysis of limonite gave :

H_2O .	SiO_2 .	SO_3 .	Al_2O_3 .	Fe_2O_3 .	Total.	Sp. gr.
13.28	1.24	1.32	1.91	81.15	98.90	3.32

also traces of CaO , P_2O_5 , and As_2O_5 .

L. J. S.

Marshite, Miersite and Iodyrite. By LEONARD J. SPENCER (*Min. Mag.*, 1901, 13, 38—53).—A description is given of crystals of marshite, miersite and iodyrite from Broken Hill, New South Wales. Marshite, CuI (Abstr., 1895, ii, 504), and the new mineral miersite, $(\text{Ag,Cu})\text{I}$, are tetrahedral-cubic with crystallographic characters identical with those of zinc-blende. The crystals of iodyrite are of two types : (a) hexagonal plates or prisms, (b) pseudo-cubic crystals of tetrahedral habit, like marshite and miersite, but really consisting of four simple rhombohedral crystals twinned together ; the former have been formed below 146° (assuming atmospheric pressure), and the latter at a temperature higher than this. When miersite is fused on a microscope slide, two distinct changes in state are to be observed during the cooling, and by comparing these changes with those shown by copper iodide and silver iodide in known proportions, the composition of miersite is deduced as probably being 4AgI,CuI . This appears to be a molecular compound, which on one hand mixes isomorphously with marshite, and on the other forms intimate and regular intergrowths with iodyrite of type (b). The same relation exists between miersite and iodyrite as between zinc-blende and wurtzite, and so far as crystallographic characters are concerned these form a perfect example of an isodimorphous group ; but apparently the only chemical relation between zinc sulphide and silver iodide is that their simplest conceivable molecules contain two atoms.

L. J. S.

Relation of Conchite to Aragonite. By REINHARD BRAUNS (*Centr. Min.*, 1901, 134—135).—The characters given for conchite (this vol., ii, 168) are sufficiently close, considering the unsatisfactory nature of the material available for examination, to those of aragonite to point to their identity.

L. J. S.

Manganese Minerals from Hautes-Pyrénées. By ALFRED LACROIX (*Bull. Soc. franç. Min.*, 1900, 23, 251—255).—The schistose limestones of the mountain of Serre d'Azet are impregnated with rhodonite, friedelite, rhodochrosite, alabandite, hübnerite, tephroite and various manganese oxides. The supposed new minerals viellaurite ($5\text{MnCO}_3, 2\text{Mn}_2\text{SiO}_4$) and torrensite ($\text{MnCO}_3, \text{MnSiO}_3, \frac{1}{2}\text{H}_2\text{O}$) from this locality (Abstr., 1899, ii, 761) are shown on a microscopical examination to be really rocks. The former consists of a mixture of grains of rhodochrosite (MnCO_3) and tephroite (Mn_2SiO_4) with a little alabandite, and the latter of rhodochrosite and rhodonite (MnSiO_3) in part altered by hydration.

L. J. S.

Sphærocobaltite from Libiola, Italy. By A. A. FERRO (*Zeit. Kryst. Min.*, 1901, 34, 302; from *Atti Soc. Ligustica, Sci. Nat., etc., Genova*, 1899, 10, 264—268).—A specimen of quartz and chalcocite from Libiola, near Casarze in Liguria, is coated with a thin crust consisting of a mixture of chessylite, malachite and a cherry-red mineral shown by the following analysis to be sphærocobaltite. At 110° , there is a loss of 0.43 per cent. of water.

CoO.	H ₂ O(200°).	CuO.	FeO.	CaO.	CO ₂ .	Total.
59.68	0.25	2.87	0.90	0.18	[36.12]	100.00

The water and copper are present as chessylite.

L. J. S.

Hussakite, a New Mineral allied to Xenotime. By E. H. KRAUS and J. REITINGER (*Zeit. Kryst. Min.*, 1901, 34, 268—277).—The xenotime of Dattas near Diamantina in Brazil, analysed by Gorceix in 1886, is shown by a new analysis (I) not to be an orthophosphate of rare earths but a sulphato-phosphate with the formula $3\text{R}_2\text{O}_3, 3\text{P}_2\text{O}_5, \text{SO}_3$. The new name hussakite is given because of this difference in composition. It is found in sands as long prismatic crystals with a very good prism cleavage; these are yellow to brown and transparent and quite fresh. The angles are the same as for ordinary xenotime. Sp. gr. 4.587. Optical determinations are given.

	SO ₃ .	P ₂ O ₅ .	Y ₂ O ₃ .	Er ₂ O ₃ .	Gd ₂ O ₃ .	Fe ₂ O ₃ .	Al ₂ O ₃ .	CaO.	MgO.	Total.
I.	6.13	33.51	43.43	14.82	1.99	0.20	traces			100.08
II.	2.68	27.37	45.86	13.67	0.42	4.54	1.16	2.56	0.45	99.70

Analysis II (contains also SiO₂ 0.62, H₂O 0.37) is of pyramidal crystals of cloudy, opaque xenotime from sands at Bandeira de Mello, Bahia, Brazil. This appears to be intermediate between xenotime and hussakite. Sulphur trioxide was also found in slightly altered xenotime from Hitterö, but not in the much altered xenotime of other Norwegian localities. It thus appears that hussakite is liable to alteration, the sulphur trioxide being extracted, and that ordinary

xenotime containing no sulphur trioxide is really a pseudomorph after hussakite. This is supported by the fact that the sulphur trioxide is easily extracted from powdered hussakite by digestion with hot soda solution.

L. J. S.

A British Occurrence of Mirabilite. By CHARLES O. TRECHMANN (*Min. Mag.*, 1901, 13, 73—74).—Colourless, transparent mirabilite has been found as small, irregular masses in gypsum-rock at Kirkby Thore in Westmoreland. The following analytical results agree closely with the usual formula, $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$:

Na.	SO_4 .	H_2O .	Total.
13·85	30·19	55·28	99·32

L. J. S.

Formation of Oceanic Salt Deposits, particularly of the Stassfurt Beds. XXI. Formation of Kainite at 25°. By JACOBUS H. VAN'T HOFF and WILHELM MEYERHOFFER (*Sitzungsber. Akad. Wiss. Berlin*, 1901, 420—427).—The indication previously obtained (this vol., ii, 249) of the formation of kainite ($\text{MgSO}_4 \cdot \text{KCl} \cdot 3\text{H}_2\text{O}$) at 25° has been confirmed. The conditions of its formation have been studied, and the results are treated graphically, as in earlier papers.

J. C. P.

Analysis of a Bröggerite. By KARL A. HOFMANN and W. HEIDEPRIEM (*Ber.*, 1901, 34, 914—915).—The specimen of bröggerite from Raade near Moss in Norway from which radioactive lead was obtained (see this vol., ii, 216) had a hardness 5·5 and a sp. gr. 9·06 at 15°. Analysis gave:

UO_2 .	UO_3 .	ThO_2 .	Yttria earths.	Fe_2O_3 .	Bi_2O_3 .	PbO .
50·00	27·83	4·96	4·56	0·46	0·35	9·21

R. H. P.

Forsterite from Latium: Diopside from Siberia. By FERRUCCIO ZAMBONINI (*Zeit. Kryst. Min.*, 1901, 34, 228—229).—Analysis of transparent, almost colourless crystals of forsterite from the Albanian Mountains, gave:

SiO_2 .	MgO .	FeO .	CaO .	$(\text{Na}, \text{K})_2\text{O}$.	Total.
42·06	55·93	1·15	0·28	0·21	99·63

The following analysis of small crystals of diopside from Altyn-Tübe, in the Kirghese Steppes, agrees with the usual formula H_2CuSiO_4 .

SiO_2 .	CuO .	Fe_2O_3 .	H_2O .	Total.
38·25	50·18	0·13	11·39	99·95

L. J. S.

Analysis of a Zeolite. By G. ONGARO (*Zeit. Kryst. Min.*, 1901, 34, 310; from *Rivista di Min.*, &c., 1899—1900, 23, 35—36).—The mineral analysed occurs as radial red masses mixed with calcite in the augite-porphry of the Valle dei Zuccanti, and is known as "red natrolite." The following composition of the pure transparent crystals approaches that of stilbite:

SiO ₂ .	Al ₂ O ₃ .	CaO.	Na ₂ O.	H ₂ O.	Total.
58·76	17·13	9·37	0·23	14·47	99·96
L. J. S.					

Analysis of White Microcline from the Ilmen Mountains. By J. SIOMA (*Zeit. Kryst. Min.*, 1901, 34, 278—279).—White microcline is an important constituent of the elaeolite-syenite of the Ilmen Mountains, Urals. The cleavage angle, 010 : 001, varies between 89°53' and 90°30'. Extinction on 001, -1°30'; on 010, -7°30'. Sp. gr. 2·592. In composition it resembles the cryptoperthite of the Norwegian elaeolite-syenite.

SiO ₂ .	Al ₂ O ₃ (trace Fe ₂ O ₃).	CaO.	MgO.	K ₂ O.	Na ₂ O.	H ₂ O.	Total.
65·48	21·12	1·44	0·17	6·56	5·25	0·18	100·20
L. J. S.							

Müllerite, Melite, and Schrötterite. By FERRUCCIO ZAMBONINI (*Zeit. Kryst. Min.*, 1901, 34, 225—227. Compare Abstr., 1900, ii, 149).—Müllerite is identical with a mineral [chloropal] from Starbo, Sweden, analysed by Weibull in 1881. The author's first analysis of schrötterite from Saalfeld, Thuringia, was made on material intimately intergrown with melite. The following new analysis gives the formula $7\text{Al}_2\text{O}_3, 3\text{SiO}_2, 36\text{H}_2\text{O}$.

SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	CaO.	H ₂ O.	Total.
11·73	45·78	0·31	0·24	41·67	99·73

The formula of melite is now given as $2(\text{Al}, \text{Fe})_2\text{O}_3, \text{SiO}_2, 8\text{H}_2\text{O}$.

L. J. S.

Termierite and Lassallite, Two New Silicates. By GEORGES FRIEDEL (*Bull. Soc. franç. Min.*, 1901, 24, 6—14).—The antimony vein of Miramont, in the concession of Souliac on the borders of Cantal and Haute-Loire, contains stibnite, barytes, and the three following substances: I, a white, finely crystalline powder with the optical and chemical (anal. I) characters of kaolinite. II, resembles clay in appearance, and receives the new name *termierite*. Under the microscope it is birefringent. In dry air it loses water and becomes opaque; at 110° it still contains 6·8 per cent. of water; when immersed in water it absorbs 72·4 per cent., increasing in volume and becoming translucent. Analysis II is of the calcined material; the formula is given as $6\text{SiO}_2, \text{Al}_2\text{O}_3 + 18\text{H}_2\text{O}$. III has the appearance of felted asbestos, and receives the new name *lassallite*. Under the microscope it is seen to consist of fine birefringent fibres. In the natural state it contains about 30 per cent. of water, and at 100° still contains 14·22 per cent. When immersed in water it swells up and becomes viscous. Analysis III is of the calcined material. Formula, $12\text{SiO}_2, 2\text{Al}_2\text{O}_3, 3\text{MgO} + 8\text{H}_2\text{O}$.

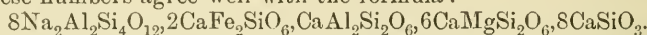
	SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	CaO.	MgO.	K ₂ O.	H ₂ O.	Total.
I.	44·48	36·24	2·18	0·44	0·19	2·03	14·12	99·68
II.	78·29	15·00	4·85	1·77	0·47	—	—	100·38
III.	69·27	19·42	0·84	1·30	10·01	—	—	100·84

L. J. S.

A Sodiferous Pyroxene from the Neighbourhood of Oropa in the Biellesi. By FERRUCCIO ZAMBONINI (*Atti Real. Accad. Lincei*, 1901, [v], 10, i, 240—244).—The author describes a pale greenish pyroxene found in masses 7 or 8 centimetres long and 1 cm. wide, which together with granite, amphibole and broad plates of white mica, forms numerous nodules and lenticular masses distributed in the micaceous schist on the southern slope of the Cima Cucco to the east of Oropa. The crystalline system is shown to be monoclinic, not triclinic as Arzruni suggested on optical evidence. The chemical composition of the mineral is as follows :

SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	CaO.	MgO.	Na ₂ O.	K ₂ O.	Loss on ignition.	Total.
53·54	14·79	5·14	14·83	3·59	7·73	0·27	0·28	100·17

These numbers agree well with the formula :



The specimen hence belongs to that group of pyroxenes which, owing to the large proportion of sexavalent elements and of sodium, may be termed jadeitoid pyroxenes.

T. H. P.

Some Iowa Dolomites. By NICHOLAS KNIGHT (*Amer. J. Sci.*, 1901, [iv], 11, 244—246).—Analyses are given of seven dolomitic limestones from Iowa. Five of them closely approach typical dolomite ($\text{CaCO}_3, \text{MgCO}_3$) in composition, and the only impurities present are small amounts of ferric oxide, alumina, and silica.

L. J. S.

Koswite, a new pyroxenite from the Urals. By LOUIS DUPARC and FRANCIS PEARCE (*Compt. rend.*, 1901, 132, 892—894).—Associated with olivine-gabbros in the Solikamsk district, near the source of the Kosswa river, is a new type of basic eruptive rock to which the name koswite is given. It consists of diallage, olivine, hornblende, magnetite and picotite. The magnetite is present in large amount between the other constituents, and corresponds with the quartz in granite. As the magnetite decreases in amount and becomes idiomorphic, there is a passage from koswite to ordinary pyroxenite. Chemical analyses of the rock are given.

L. J. S.

Perofskite from Emarese in Val d'Aosta. By FEDERICO MILLOSEVICH (*Atti Real. Accad. Lincei*, 1901, [v], 10, i, 209—211).—The author describes crystals of perofskite found in the asbestos caves of Emarese, which are at a height of about 1200 metres. The crystals are cubic in habit having in some cases a side 3 mm. long, and are accompanied by chlorite and magnetite. They resemble closely the crystals found in the Urals, and have a composition agreeing almost exactly with the formula CaTiO_3 , traces of MgO being also present.

T. H. P.

Presence of Nitrides, Argonides, Arsenides, and Iodides in the Crystalline Rocks. By ARMAND GAUTIER (*Compt. rend.*, 1901, 132, 932—938. Compare this vol., ii, 14).—Specimens of mica-

schist, basalt, granulite, and several varieties of granite when finely powdered and heated to redness, or boiled with acids, yield nitrogen accompanied by traces of argon, but no helium. These gases are derived from the nitrides and argenides present in the plutonic rocks; the former compounds give up only a portion of their nitrogen in the free state, the remainder being eliminated in the form of ammonia, which remains in the acid. In order to estimate the quantity of ammonia evolved from a rock specimen, the finally powdered substance is digested for some time at 100° with syrupy phosphoric acid diluted with 2 to 3 vols. of water. About 1 to 2 per cent. of the total nitrogen of these rocks exists in the form of iron nitrides; these substances are extracted from the crushed mineral by the aid of a magnet.

Iodine is also present in small quantities in the granite; it is eliminated by distilling the mineral with pure concentrated sulphuric acid, and estimated by the author's method (*Compt. rend.*, 1899, 128, 644). This element is very generally accompanied by arsenic; all the samples of granite examined contain the latter substance. The ophitic rock of Villefranche, however, does not contain either of these elements. The gases evolved from the earth's crust, whether dissolved in the natural mineral waters or issuing into the atmosphere, are probably formed by the action of water at high temperatures on the silicates, nitrides, carbides, sulphides, arsenides, and other accessory constituents of the igneous rocks. (Compare this vol., ii, 171, 322).

G. T. M.

Mineral Constituents of Dust and Soot from Various Sources. By W. NOEL HARTLEY and HUGH RAMAGE (*Proc. Roy. Soc.*, 1901, 68, 97—109).—Soot is found to contain nickel, so that the presence of this metal does not prove that the dust from the clouds comes from other than a terrestrial source. Examination of a dust which fell during a calm night in November 1897, showed that its composition was quite unlike that of volcanic dust, or of dust from various chemical and metallurgical works; it is magnetic, very regular in composition, and probably of cosmic origin. The authors draw attention to the wide distribution of gallium in small traces; it occurs in all aluminous minerals, in flue dust from various sources, in soot and atmospheric dust, as well as in many iron ores.

J. C. P.

Meteoric Iron from Kokstad, Bethanien, and Muchachos. By EMIL W. COHEN (*Chem. Centr.*, 1901, i, 851; from *Mitt. nat. Ver. Neuvorpommern u. Rügen*, 1900, 1—43).—The specimens of meteoric iron from Kokstad, Bethanien, and Muchachos in the Vienna Natural History Museum have been again examined. The nickel-iron does not form a homogeneous mass but is traversed by extremely narrow, lustrous, zig-zag seams and the specimens contain olivine and plagioclase. The Carleton meteoric iron contains 94·07 per cent. of nickel-iron, 1·04 of schreibersite, 0·07 of lawrencite, and 4·82 of olivine; its bulk analysis is given under I, and that of the olivine isolated from it by means of copper-ammonium chloride under II. It thus appears to be a forsterite mixed with a small quantity of monticellite silicate. The mass of the olivine is found to be practically free from iron when the

opaque portions contained in it are taken into account. The Muchachos iron belongs to a special group of the ataxites.

	Fe.	Ni.	Co.	Cu.	Cr.	C.	S.
I.	84.56	8.89	1.36	0.03	0.02	0.04	trace.
II.	—	—	—	—	—	—	—

	Cl.	P.	SiO ₂ .	FeO.	MgO.	CaO.	Olivine and residue.
I.	0.04	0.16	1.72	—	0.59	trace	3.68
II.	—	—	43.29	0.52	54.92	1.13	—

E. W. W.

Meteorite Stones which fell at Zomba, British Central Africa. By LAZARUS FLETCHER (*Min. Mag.*, 1901, 13, 1—37).—On January 25th, 1899, a single loud detonation was accompanied by the fall of several meteoric stones over an area of about 9 by 3 miles near Zomba, in British Central Africa. The largest of the ten stones collected weighs 5 lbs. 12 $\frac{1}{2}$ ozs. Sp. gr. 3.545. As seen under the microscope, the structure is crystalline, and there are few chondrules. From detailed analyses of the portion attracted by a magnet and of the unattracted portion, decomposed and undecomposed by hydrochloric acid, the percentage mineralogical composition of the stone is deduced as follows:

Nickel-iron.	Olivine.	Enstatite.	Oligoclase.	Troilite.	Chromite.
8.61	42.44	34.80	8.77	4.85	0.53

The calculated percentage compositions of the enstatite, of the oligoclase, and of the olivine are given under I, II, and III respectively.

	SiO ₂ .	Al ₂ O ₃ .	FeO.	MnO.	CaO.	MgO.	Na ₂ O.	K ₂ O.	Sp. gr.
I.	55.64	—	12.76	0.49	3.80	27.31	—	—	3.314
II.	61.55	24.04	—	—	5.61	—	7.90	0.90	—
III.	38.25	—	23.23	0.45	1.18	36.89	—	—	—

Full details are given of the methods of analysis and of the calculation of the results. In chemical composition and structure, the Zomba meteorite is very similar to that from Linn County, Iowa.

L. J. S.

Physiological Chemistry.

Action of Isotonic Solutions of Chlorides and Sugar on Frogs' Eggs. By MADAME RONDEAU-LUZEAU (*Compt. rend.*, 1901, 132, 997—999).—The eggs of *Rana fusca* were exposed for varying periods to the action of solutions of sugar and salt of varying strengths. On unfertilised eggs, the results are practically negative; after fertilisation, the eggs appear to be more sensitive to the physical action of the solutions; the effects described are very irregular.

W. D. H.

Comparative Value of Saline and Saccharine Solutions in experimental Teratogenesis. By E. BATAILLON (*Compt. rend.*, 1901, 132, 852—854).—Solutions of salt, sugar, and other substances, if employed in isotonic quantities, determine the same changes in the development of frog embryos, and the abnormalities observed depend on the plasmolysis which such solutions engender. W. D. H.

A New Histon from Fish-sperm. By ROBERT EHRSTRÖM (*Zeit. physiol. Chem.*, 1901, 32, 350—354).—The testicles of the fish *Lota vulgaris* (a member of the cod family) contain histon instead of protamine. Histon has been previously described in the sperm of other fishes, and it is considered probable that in process of ripening it forms the source of the protamine. The following table compares the percentage amounts of certain products obtained from three varieties of histon :

	Lota-histon.	Cod-histon.	Thymus-histon.
Ammonia	0.66	0.74	1.66
Histidine	2.85	2.34	1.21
Lysine	3.17	8.30	7.70
Arginine	12.00	15.22	14.36

W. D. H.

Nature of Pepsin. By MARCELLUS NENCKI and NATALIE SIEBER (*Zeit. physiol. Chem.*, 1901, 32, 291—319).—Gastric juice was obtained by the Pawloff-Schoumoff-Simanowski method, and from it pepsin was precipitated by cooling to 0°. The product appears to be identical with that obtained by Pekelharing's method (*Abstr.*, 1897, ii, 60), or by precipitation with ammonium sulphate. The molecules of pepsin are described as "labile" and "giant," consisting of nucleo-proteid, united to iron, phosphoric acid, pentose, lecithin, and chlorine. The various actions of gastric juice, namely, its peptonising action, milk-curdling action, and the formation of an insoluble material, plastein, from proteoses, are all attributed to this material. W. D. H.

Mett's Method of estimating Peptic Activity. By ALEXANDR A. SAMOJLOFF (*Pflüger's Archiv*, 1901, 85, 86—89).—Mett's method consists in measuring the decrease in length of cylinders of egg white coagulated in capillary tubes, which occurs under the influence of artificial digestive juices. The method is recommended as an accurate one. The law that peptic activity is proportional to the square root of the amount of pepsin present is shown to be true, except when the amount of pepsin is very great; with high concentrations, the figures found are less than those calculated.

Similar work by A. Walter (*Inaug. Diss. Petersburg*, 1897) has shown that the same law holds for trypsin. W. D. H.

Alcohol as a Stimulant of Gastric Secretion. By C. RADZIKOWSKI (*Pflüger's Archiv*, 1901, 84, 513—526). **Two Pure Peptogens.** By FR. R. MARK-SCHNORF (*ibid.*, 85, 143—148).—Substances which stimulate gastric secretion may be divided into those which increase the flow of the juice (peptagogues), and those which increase the secretion of pepsin (peptogens) (compare Herzen, this vol., ii, 323). Alcohol has simply the former effect; it acts best if given by

the mouth, but also to a less degree by the rectum. Its occurrence in the blood in small quantities does not hinder the change of propepsin into pepsin under the influence of Schiff's peptogens.

Inulin and glycogen are exclusively peptogenic in their action, without a trace of peptagogue activity; pure dextrin is neither.

W. D. H.

Action of Alcohol on the Gastric Secretion. By ALBERT FROUIN and M. MOLINIER (*Compt. rend.*, 1901, 132, 1001—1003).—Experiments made on dogs show that alcohol promotes the secretion of gastric juice. This phenomenon is due to the specific action of the substance on the nervous system, not merely to local action or to the irritation of the nerve endings of the alimentary track, similar results being obtained whether the alcohol is introduced through the mouth or directly injected into the intestine.

G. T. M.

Variation of the Quantity of Thiocyanate contained in Human Saliva and its Causes in Health and Disease. By JUL. A. GROBER (*Chem. Centr.*, 1901, i, 839—840; from *Deut. Arch. klin. Med.*, 69, 243—257).—Potassium thiocyanate is found in the human body only in the saliva. It is not formed by the decomposition of the saliva, but is actually secreted, and the quantity diminishes with the duration of the secretion. The quantity present in the saliva is not affected by change of diet in the case of healthy persons or by the use of tobacco by non-smokers, but it appears to increase after administering extremely small doses of hydrocyanic acid. The secretion of the thiocyanate is probably dependent on the condition of the organism in respect to the albumin decomposed and utilised, and where this is small in amount, as in severe cachectic cases, little or no thiocyanate is secreted.

E. W. W.

The Functions of Bile as a Solvent. By BENJAMIN MOORE and WILLIAM H. PARKER (*Proc. Roy. Soc.*, 1901, 68, 64—76).—Bile acts as a solvent in two ways: (1) it dissolves lecithin, and, to a less extent, cholesterol; it thus aids the excretion of these otherwise insoluble substances by the liver cells, and their carriage to the intestine; (2) it dissolves both free fatty acids and soaps, and thus renders the absorption of these substances easier. The solvent properties are chiefly due to the bile salts, but in the case of the fatty acids and soaps the amount dissolved is greatly increased by the simultaneous presence of lecithin.

W. D. H.

A Proteolytic Enzyme in the Spleen. By SVEN G. HEDIN and S. ROWLAND (*Zeit. physiol. Chem.*, 1901, 32, 341—349).—The juice expressed from the spleen of the ox, sheep, and pig contains a proteolytic enzyme, which works best in an acid medium. Whether the enzyme is present as such, or as a zymogen, was not determined; the enzyme itself is not trypsin.

W. D. H.

A Type of Reaction by which Sodium Carbonate and Hydrochloric Acid may be formed in the Animal Organism. By THOMAS B. OSBORNE (*Amer. J. Physiol.*, 1901, 5, 180—181).—Crystalline globulin (edestin) is a mixture of salts of proteid, chiefly hydrochlorides and sulphates. Edestin was suspended in water, and neutralised by

potassium hydroxide. It was then washed with water and dissolved in sodium chloride solution, carbon dioxide was then passed through the diluted solution, and the precipitated edestin was washed, dehydrated, and dried. Solutions of this in water or strong sodium chloride solution are acid. Fifteen grams of this were dissolved and treated with 28.5 c.c. of decinormal potassium hydroxide; the edestin so precipitated was washed with water, the filtrate and washings contained 0.23 gram of solid residue, of which 0.022 was organic, and 0.212 inorganic (KCl , 0.199; K_2SO_4 , 0.015). Thus, more than 93 per cent. of the potassium added was recovered as chloride, and from the edestin there had precipitated 0.097 gram of hydrochloric acid, or 0.072 per cent. of the protein. Corresponding with this quantity of hydrochloric acid, 0.1417 gram of sodium carbonate must have been produced in the salt solution by the carbon dioxide. It is considered probable that by a similar reaction, both sodium carbonate and hydrochloric acid may be formed from sodium chloride in the organism, since there is always sodium chloride and proteid matter present when carbon dioxide is produced in the tissues.

W. D. H.

Theory of Proteid Digestion. By W. W. SAWJALOFF (*Pflüger's Archiv*, 1901, 85, 171—225).—The theory advanced is that the object of peptonisation is not to render proteid matter easier of absorption, for side by side with this process there is another which begins while the proteid is still within the alimentary canal, and which is a change in the reverse direction, building up proteids of large molecular weight from the products of peptonisation. This action is attributed to the rennet ferment. It is pointed out that rennet is not confined to the gastric juice of animals which take milk; it is, for instance, found in fishes. Gastric juice in virtue of this ferment is able to cause the formation of a precipitate or clot in solutions of proteoses and peptone. The name *plastein* has recently been given to this insoluble substance. Much of the present paper is taken up with a description of the properties of plastein and the conditions of its formation in acid and alkaline media; its percentage composition appears to be about the same whatever proteid is subjected originally to digestion; its properties are much the same as those of Kühne's anti-albumid. A number of different proteids are digested, but the varieties of proteid found in the blood are constant. Pepsin-hydrochloric acid breaks down proteid of all kinds into simpler substances, and from these a plastein of constant composition is resynthesised.

W. D. H.

The Absorption of Artificially Coloured Fats. By LUDWIG HOFBAUER (*Pflüger's Archiv*, 1901, 84, 619—627); by SIGM. EXNER (*ibid.*, 628—635); by EDUARD PFLÜGER (*ibid.*, 85, 1—58).—Polemical. The two first named authors maintain that the phenomena of absorption of coloured fats support the emulsion theory. In the third paper of the series, the author maintains that the methods of experiment are faulty, and that the opposite theory is correct.

W. D. H.

Fat Digestion. By SIEGFRIED ROSENBERG (*Pflüger's Archiv*, 1901, 85, 152—170).—In order to discover whether soaps are completely absorbed, they were introduced directly by a fistulous opening into

the bowel in dogs, and the faeces examined. The results obtained do not support the Cohnstein-Pflüger theory that all fat is absorbed in the form of soap, and that saponified fat requires bile for its absorption, as much as neutral fat and fatty acid do. W. D. H.

Action of Carbon Dioxide on Blood Vessels. By WILLIAM M. BAYLISS (*Proc. physiol. Soc.*, 1901, xxxii—xxxiii).—Observations were made in the blood vessels of the frogs which were perfused with Ringer's solution, in some experiments saturated with air, in others with carbon dioxide. Dilatation about equal to that produced by lactic acid (1 in 10,000) was observed. In mammals, no local action could be detected. W. D. H.

Sugar in Normal Hen's Blood. By S. SAITO and K. KATSUYAMA (*Zeit. physiol. Chem.*, 1901, 32, 231—234).—The amount of sugar in normal hen's blood is about 0.2 per cent. This is more than in dogs and rabbits. The sugar was identified as dextrose. W. D. H.

Febrile Changes in the Chemical Composition of Blood. By KARL RITTER VON STEJSKAL (*Chem. Centr.*, 1901, i, 845; from *Zeit. klin. Med.*, 42, 309—323).—The blood of fever patients has been found to contain less albumin, fat, cholesterol, iron, and chlorine, and to yield a smaller quantity of dry substances than normal blood. On the other hand, the quantities of water, calcium, potassium, and ash were in excess of the usual amount, whilst the amounts of lecithin and sodium were normal. The blood serum showed a decrease of albumin, substances soluble in ether, chlorides, and dry substances, but contained a greater quantity of potassium, and yielded a larger ash. The fact that in the febrile state the red corpuscles contain less albumin, lecithin, and cholesterol, but are richer in water and salts, can only be due to imbibition of solutions containing salts (plasma) and especially chlorides. The red corpuscles had increased in weight, whilst the plasma had correspondingly decreased. E. W. W.

The Ammonium Sulphate Method of separating the Proteids of Horse-serum. By W. POPPLEWELL BLOXAM (*Proc. physiol. Soc.*, 1901, xxxiii—xxxv).—Quantitative estimations show that the globulin of horse-serum loses weight on re-solution and reprecipitation by half-saturation with ammonium sulphate. This tends to show that either the method is faulty, or that globulin is changed into albumin by treatment with the salt. W. D. H.

Coagulating Properties of Mucin. By ALBERT CHARRIN and MOUSSU (*Compt. rend.*, 1901, 132, 578—580).—Experiments are given which show that solutions of 'mucus' collected mostly from the respiratory tract, when injected into animals produce intravascular clotting of the blood. W. D. H.

Formation of Oxalic Acid in the Human Body. By N. STRADOMSKY (*Virchow's Archiv*, 1901, 163, 404—440).—The oxalic acid of the urine has a double origin: (1) from the food; (2) as a result of normal metabolism. On a mixed diet containing practically no oxalic acid, the 24 hours' urine contains 0.015 gram. Increase of pro-

teid food increases the amount; creatine is possibly an intermediate substance; gelatin increases the amount. If oxalic acid is given by the mouth, 35.3 per cent. reappears in urine and faeces. Of the remainder, some, doubtless, is broken up by bacteria in the intestine, and some is oxidised and leaves the body in other ways. W. D. H.

Formation of Lactic Acid in the Organism. By S. SAITO and K. KATSUYAMA (*Zeit. physiol. Chem.*, 1901, 32, 214—230).—The experiments were made on hens; the normal blood of these animals contains 0.02 per cent. of *d*-lactic acid. After extirpation of the liver, the amount rises considerably, and passes into the urine. The same is true when oxidation is diminished, as in poisoning by carbon monoxide. W. D. H.

Mineral Composition of the Human Foetus and New-born Child. By LOUIS HUGOUNENQ (*Ann. Chim. Phys.*, 1901, 22, [vii], 370—393. Compare Abstr., 1899, ii, 503, 682; 1900, ii, 418, 490).—The generalisations deduced from the analyses tabulated in this paper have already been published. G. T. M.

Composition of Fatty Substances in the Animal Organism. By VALDEMAR HENRIQUES and C. HANSEN (*Bied. Centr.*, 1901, 30, 182—186; from *Overs. K. dansk. Videnskab. Selskabs Forhandl.*, 1900, No. 3, 225—241. Compare Abstr., 1900, ii, 668).—The iodine numbers and solidifying points were determined in fat from different parts of the bodies of different animals. In the case of dogs, horses, bullocks, pigs, camels, and geese, it was found that the amount of liquid (unsaturated) fatty acids decreases as the position of the fat approaches the warmest parts of the body.

The fat in the back of a well-fed pig can be readily separated into two layers; in every case, the outer layer showed a higher iodine number, and a lower solidifying point, than the inner layer. Similar results were obtained when the two layers were each subdivided. The fat of pigs fed with maize showed higher iodine numbers than when they were fed with barley, but the difference in feeding did not affect the relation between the inner and outer fat. The iodine numbers of the kidney fat were still lower than those of the deeper portions of the fat on the back. Fat from the hump of a camel gave similar results.

The fat from all parts of seals has a very high iodine number (150—160), due to fatty acids with very little hydrogen. By cooling the very fluid fats at 3° for some days, separations of crystals were obtained, the greatest amounts being in the fats from the lowest layers.

In the case of dolphin fat, the iodine numbers increase with the depth of the fat. The melting point also increases, but in this case the lower melting point of the surface fat is not due to olein, but to valerin.

Experiments were made with pigs under different conditions of temperature; the one was kept in a room at 30—35°, the second was kept at 0°, but with a sheep-skin (with the wool) sewn round it, and the third was kept at 0° in its natural condition. The surface fat of the pig kept at the lowest temperature was found to contain the most

olein, whilst that of the pig with the woolly cover showed the lowest iodine number and the highest solidifying point.

Determinations of the temperature of the different layers of fat showed considerable differences. The following results were obtained: At 1 cm. under the skin, 33.7° ; at 2, 3, and 4 cm., 34.8° , 37.0° , and 39.0° respectively.

N. H. J. M.

Complete Removal of the Suprarenal Glands. By BEN JAMIN MOORE and C. O. PURINTON (*Amer. J. Physiol.*, 1901, 5, 182—190).—In the cat, complete removal of the suprarenal glands is always, in goats generally, fatal. The chief symptoms are extreme muscular weakness and rapid, shallow breathing. In cats, rapid clonic convulsions were observed. Death is due to respiratory failure, and in three out of seven cases ante-mortem clotting in the right heart, and the vessels connected with it, was observed.

W. D. H.

Methods for determining the Limits of Olfactory Sensibility. By MARCELLIN P. E. BERTHELOT (*Ann. Chim. Phys.*, 1901, 22, [vii], 460—464).—This note contains a description of an apparatus consisting of a series of large flasks in which air containing a definite quantity of some odoriferous substance may be quantitatively diluted until the odour ceases to be perceptible. The atmosphere of the first flask of the series was saturated with iodoform vapour and then contained 1.1 mg. of this substance in 4 litres of air; 40 c.c. of this atmosphere were then introduced into the second flask, which was then found to have a distinct odour of the compound. After two repetitions of the process of dilution, the odour could not be distinguished in 1 c.c. of the air of the fourth flask. The odour of musk, however, persists even when the dilution is one thousand times greater than that of the preceding experiment.

G. T. M.

Distribution of Galactase in different Species of Mammalia. By S. MOULTON BABCOCK, H. L. RUSSELL, and ALFRED VIVIAN (*15th Ann. Rep. Agric. Expt. Stat. Univ. Wisconsin*, for 1897—1898, 93—97).—Galactase was found to be present, not only in cow's milk but in human milk and the milk of sheep, goats, pigs, mares, and a half-bred buffalo. Owing to the varying chemical composition of the different milks, the amount of galactase could not be determined.

N. H. J. M.

Distribution of Galactase in Cow's Milk. By S. MOULTON BABCOCK, H. L. RUSSELL, and ALFRED VIVIAN (*15th Ann. Rep. Agric. Expt. Stat. Univ. Wisconsin*, for 1897—1898, 87—92).—The estimation of the amount of galactase, measured by the amount of soluble proteids formed, showed but little difference at various stages in the period of lactation. During the colostrum period, the amount of soluble proteids seemed to be slightly increased at the beginning, as compared with normal milk, five days after calving, but the reason for this difference is uncertain.

The milk taken from different cows at the same period of lactation was found not to vary to any extent as regards the amount of galactase.

N. H. J. M.

Influence of the Amount of Water consumed on the Secretion of Milk. By B. KOCH (*J. Landw.*, 1901, 49, 61—88).—Increased consumption of water, induced by adding salt to the food of cows, does not increase the yield of milk or cause any considerable diminution in the amount of dry matter in the milk. In some cases, when the amount of salt is not excessive, individual cows may yield rather more milk than without salt; the effect on other cows, may, however, be just the opposite.

N. H. J. M.

Excretion of Phosphorus during Inanition. By FRIEDRICH N. SCHULZ and J. MAINZER (*Zeit. physiol. Chem.*, 1901, 32, 268—277).—The principal proteid constituent of protoplasm contains phosphorus, and this element is most abundant in the nucleus, which is the most important part of a cell. Experiment appears to show that in hunger the phosphorised constituents of the cell are the most protected. The ante-mortem rise of nitrogenous excretion may be regarded as a sparing action of this kind, but in the few experiments recorded, the proportion of nitrogen to phosphorus was very variable, and did not bear out the view.

W. D. H.

Excretion of Nitrogen after Extirpation of the Liver. By S. LANG (*Zeit. physiol. Chem.*, 1901, 32, 320—340).—The urine was examined which was passed in birds during the few hours that intervened between removal of the liver and death. The nitrogen was estimated in three fractions: (1) That which can be driven off by magnesia; this is mainly derived from the ammonia, but also includes a small amount from urea. This amount was much increased. (2) That present after the removal of the first fraction, which is precipitated by phosphotungstic acid. This corresponds to the uric acid and purine bases. Administration of alkali does not, under the conditions of these experiments, raise the amount of uric acid. (3) The nitrogen left after the separation of fraction 2 is derived from amino-acids, urea, and creatine. Full details of numerous experiments are given.

W. D. H.

Influence of certain Diuretics on the Excretion of Alkalis. By K. KATSUYAMA (*Zeit. physiol. Chem.*, 1901, 32, 235—240).—Urea and diuretin both cause an increase in the amount of chlorides and alkalis (especially sodium salts) in the urine. In this they resemble theine. The experiments were made on rabbits in a state of hunger.

W. D. H.

Excretion of Kynurenic Acid. By WILLIAM J. GIES (*Amer. J. Physiol.*, 1901, 5, 191—195).—In a dog no kynurenic acid was found when the animal was in normal equilibrium. If the equilibrium was upset and proteid katabolism increased by dosage with tellurium, the acid appeared. The uric acid was constant throughout, and kynurenic acid is not associated with intestinal putrefaction.

W. D. H.

Indoxylic Origin of certain Red Colouring Matters of Urine (Indirubin). By LOUIS MAILLARD (*Compt. rend.*, 1901, 132, 990—992).—A normal urine, containing notable quantities of indigo-yielding

substances when boiled to destroy enzymes, and treated with hydrochloric acid and ferric chloride, gives a blue colouring matter (indigo). When the boiled urine is first digested with the acid, and only subsequently treated with the oxidising agent, it yields a red colouring matter. This product, which, unlike the red pigment, urorosein, is soluble in chloroform, seems identical in its properties with the indurubin derived from the *Indigoferæ*.
G. T. M.

Analysis of Liquid obtained from a Hydatid Cyst of the Liver. By F. MALMÉJAC (*J. Pharm.*, 1901, [vi], 13, 406—407).—The liquid (1012 c.c.) was perfectly colourless, limpid, and of acid reaction, and contained 13 grams of solid matter per litre, of which sodium chloride forms 5.8 grams, urea 2 grams, and calcium oxide 1 gram. In addition, small quantities of serum-albumin, sulphates, phosphates, and acetone are present.
K. J. P. O.

Action of Chloroform and Ether on the Nerve-cells of Dogs. By HAMILTON WRIGHT (*J. Physiol.*, 1901, 26, 362—365. Compare this vol., ii, 180).—The experiments support those previously recorded, and show that if anæsthesia is prolonged to nine hours in dogs, even the nucleus loses much of its affinity for basic aniline stains. After the anæsthesia passes off, recovery is absolute.
W. D. H.

Action of Nicotine on Nerve-cells. By J. HERBERT PARSONS (*Proc. Physiol. Soc.*, 1901, xxxviii—xxxix).—After nerve-cells have been placed in 1 per cent. aqueous solutions of nicotine for an hour, they undergo no histological change. This supports the view that the alkaloid acts on the synapse that surrounds the cell. A longer immersion in the solution, or the use of stronger solutions for shorter periods, produces chromatolysis.
W. D. H.

Physiological Action of Aspirin. By H. SINGER (*Pflüger's Archiv*, 1901, 84, 527—546).—Aspirin (*o*-acetoxybenzoic acid) does not increase the flow of urine, but somewhat raises the total output of solids. The total nitrogen is not affected. In rabbits (2 experiments) the consumption of oxygen is lessened from 14 to 17 per cent.; in one experiment, it was increased by 9 per cent. It causes in these animals leucocytosis, and an increased output of uric acid and purine bases. The amount of urobilin in the urine is somewhat diminished. The increase of total solids in the urine is principally due to a rise of phosphates and sulphates. The ethereal hydrogen sulphates are not affected.
W. D. H.

Physiological Action of Guanylic Acid. By IVAR BANG (*Zeit. physiol. Chem.*, 1901, 32, 201—213).—Guanylic acid intravenously injected in dogs produces great delay in blood-clotting, irregularity and disturbance of respiration, a fall of arterial blood pressure, chiefly due to dilatation of peripheral vessels, and an alkaline reaction of the urine. Albuminuria is generally present, but sugar in the urine was only found in one experiment. Injection of nucleo-proteid produces very similar effects, except that the urine is not rendered alkaline, and albuminuria is not a marked effect. The urine always contains dextrose, but no β -hydroxybutyric acid or acetone.
W. D. H.

Physiological Action of three Poisonous Toadstools. By WILLIAM S. CARTER (*Amer. J. Physiol.*, 1901, 5, 158—174).—The experiments were made with fungi dried at 40°, or with glycerol or alcoholic extracts of the fresh growth. *Amanita muscaria* produces cardiac inhibition in frogs and mammals by acting on the inhibitory mechanism of the heart itself, vaso-dilatation, arrest of respiration, salivation, contracted pupils, occasionally vomiting and purging, but never convulsions. Atropine is of antidotal value, but the fungus appears to contain, besides muscarine, some poison or poisons which are not antagonised by atropine. *A. verna* or *bulbosa* causes less effect on the heart; its chief action is to dilate blood vessels; vomiting and purging are more frequent than with *A. muscaria*, and convulsions were frequently observed due to action on the spinal cord. *A. phalloides* has a very similar action on the circulation; when cardiac inhibition occurs it is due to an effect on the cardio-inhibitory centre. There is but little action on the spinal cord. Histological examination of the nerve-cells in all three cases showed no change in them.

W. D. H.

Behaviour of Pyrimidine Compounds in the Animal Organism. By H. STEUDEL (*Zeit. physiol. Chem.*, 1901, 32, 285—290).—The different intermediate products which Behrend and Roosen employed in the synthesis of uric acid (*Abstr.*, 1888, 581) have been separately given to a fox terrier bitch in its food, in order to determine what alterations these undergo in the animal organism, and whether any of them can give rise to a purine derivative. Methyluracil is mostly obtained in the urine in an unaltered condition. Nitrouracyl-carboxylic, isobarbituric, and isodialuric acids are completely destroyed, whereas nitrouracyl passes through unaltered. Traube's 2:4-diamino- and 2:4:5-triamino-6-oxypyrimidine have a toxic action, and both are fatal in doses of 0.2 and 0.1 gram respectively.

J. J. S.

Maltosuria in a Diabetic Patient. By RAPHAEL LÉPINE and BOULUD (*Compt. rend.*, 1901, 132, 610—613).—Analyses of a specimen of diabetic urine are given which support the view that in this case, as in some others which have been met with, the sugar was a mixture of dextrose and maltose.

W. D. H.

Treatment of Carbon Monoxide Poisoning by Oxygen at Atmospheric Pressure. By NESTOR GRÉHANT (*Compt. rend.*, 1901, 132, 574—576).—In dogs, it was found that with an animal on the point of death from carbon monoxide poisoning, and then made to breathe air containing 90 per cent. of oxygen, the blood at the end of an hour contains 18.8 of oxygen and 1.1 of carbon monoxide per cent. by volume. If ordinary air is used, the numbers are respectively 16.6 and 4.5.

W. D. H.

Chemical and Microbiological Investigations on the Salting of Herrings. By SIGVAL SCHMIDT (*Bied. Centr.*, 1901, 30, 195—198; from *Rep. on Norwegian Fishery and Marine Investigations*, 1, No. 8, 1—27, Christiania, 1900).—In addition to sodium chloride, the liquid in which herrings have been salted contains potassium, calcium, magnesium, sulphuric acid, and a considerable amount of

phosphoric acid derived from the fish; solutions 2—4 weeks and $2\frac{1}{2}$ —5 years old contained 1·6 and 1·9—2·1 per thousand of P_2O_5 . No nitric or nitrous acid could be detected. The amount of nitrogen found after a few days' salting was about 0·1 per cent.; in old solutions ($2\frac{1}{2}$ and 5 years), the amounts of nitrogen were 0·9 and 1·2 per cent. In fresh solutions, most of the nitrogen is in the form of amides, but after a year albumose, peptone, and (in increasing amount) tryptophan are found. The genuine albumin of the liquor consists to only a slight extent of globulin, and contains neither nuclealbumin nor histon; it consists of at least two substances. The greater part is precipitated by 0·2 per cent. acetic acid in absence of sodium chloride, whilst in saturated salt solutions the precipitation is complete.

The amide nitrogen in the solutions represents more than 75 per cent. of the total nitrogen; only a small portion is present as xanthine and purine bases.

The white sediment deposited during salting consists partly of optically inactive, very lustrous needles, readily soluble in ether.

Most of the microbes present in the salt solutions are bacteria; even old solutions (5 years) contain some hundreds per c.c. The solutions become sterile if the fish is removed.

Analyses of herrings salted for various periods are given.

N. H. J. M.

Chemistry of Vegetable Physiology and Agriculture.

Fermentation of Sugars by *Bacillus Coli Communis* and Allied Organisms. I. By ARTHUR HARDEN (*Trans. Jenner Inst. of Preventive Medicine*, 1899, 2, 126).—The gas produced from dextrose by *Bacillus coli communis* under anaerobic conditions consists of carbon dioxide and hydrogen, the ratio in which these gases are present varying from 1:1 to 1:1·3. This gas, and that evolved from nutrient gelatin under similar conditions, contain no methane. The lactic acid produced from dextrose by the organism employed in presence of peptone water was a mixture of *l*-lactic acid with a considerable proportion of the inactive form, whereas in presence of beef-broth it consisted almost entirely of the inactive form. A. H.

Bacteria which destroy Nitrates and their Action in the Soil. By KRENZ and MAX GERLACH (*Bied. Centr.*, 1901, 30, 228—232; from *Jahresber. Landw. Versuchs-Stat. Jersitz-Posen*, 1898—1899, p. 3).—The results of pot experiments with oats showed that addition of carbonaceous food (a mixture of xylan, glycerol, and sodium lactate) greatly increased denitrification; fresh cow dung had practically no effect in presence of nitrate. Peat does not promote denitrification.

Cow urine greatly increased the yield of buckwheat; addition of carbonaceous matters diminished the yield; but the loss of nitrogen was much less than that which takes place when nitrate and carbonaceous matter are applied together.

Farmyard manure (fresh and old) increased the yield of barley, but less than nitrate. The yield obtained with farmyard manure and nitrate was greater than with nitrate alone.

The conclusion is drawn that whilst fresh cow dung is without effect on denitrification, farmyard manure which contains more or less carbonaceous food, suitable for denitrifying microbes, may act both favourably and unfavourably at the same time. N. H. J. M.

Chlorophyllous Assimilation without Living Organisms. By JEAN FRIEDEL (*Compt. rend.*, 1901, 132, 1138—1140).—By pressing leaves of spinach with glycerol, and filtering, a very clear, yellowish liquid was obtained which contained the soluble matter of the leaves. The liquid is not capable of assimilating carbon dioxide either with or without light. The green powder obtained by drying similar leaves at 100° was also found to be incapable of assimilation. When, however, the green powder is added to the solution and exposed to light, assimilation takes place. Similar results were obtained when the glycerol extract was precipitated with alcohol; on adding water and chlorophyll to the precipitate the mixture was found to have the power of absorbing carbon dioxide and liberating oxygen. The liquid is rendered inert by boiling. N. H. J. M.

Are Lower Chlorophyllous Algæ able to assimilate Free Nitrogen and to increase the amount of Nitrogen in the Soil? By W. KRÜGER and W. SCHNEIDEWIND (*Bied. Centr.*, 1901, 30, 217—218; from *Landw. Jahrb.*, 1900, 29, 771).—The results of experiments with *Stichococcus* (8), *Chlorella vulgaris* (5), *C. protothecoides* (4), and *Chlorothecium* (6 varieties), which extended over 328 to 440 days, showed that no assimilation of free nitrogen took place. It is probable that none of the lower algæ can fix nitrogen.

Some groups of algæ grew most luxuriantly when supplied with organic nitrogen; others thrive equally well in presence of inorganic nitrogen compounds.

Algæ under natural conditions are probably favourable to the growth of bacteria which fix free nitrogen. N. H. J. M.

Influence of Nutrition on the Secretion of Enzymes by *Monilia Sitophila*. By F. A. F. C. WENT (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 3, 489—502).—The mould *Monilia sitophila* is employed in West Java for decomposing arachis-seed cake; it also occurs on putrefying bread and wheat flour and on dead leaf-sheaths of the sugar cane. The mould has a bright orange-red colour. The pigment dissolves in alcohol, ether, benzene, chloroform, &c., yielding golden-yellow to brownish-red solutions with a faintly green fluorescence, the absorption spectrum of which shows a dark zone, embracing the whole of the blue and violet portions from about F. The pigment is only produced in presence of light (the blue and violet rays); in light

which has passed through potassium dichromate solution, or a solution of the pigment itself, the mould remains colourless.

As regards the conditions of nutrition, proteid substances and peptone can serve as sources both of nitrogen and carbon. Tyrosine, asparagine, aspartic acid, leucine, nitrates, nitrites, ammonium salts, alanine, and glycine are also suitable nitrogenous nutrients. Urea, hippuric acid, creatine, and caffeine are unsuitable. The best carbonaceous foods are raffinose, starch, dextrin, maltose, and cellulose; dextrose, lævulose, mannose, and glycogen are less suitable; sucrose, galactose, lactose, arabinose, arabin, and inulin are still less favourable. Other carbon compounds which serve as food for the mould are glycerol, mannitol, erythritol, dulcitol, and in a slight degree ethyl alcohol, acetates, tartrates, lactates, and malates. Fats are not good sources of carbon but are utilised to some extent.

The suitability of a nitrogenous food depends on the nature of the carbonaceous food present, and *vice versa*. Comparing maltose, glucose, lactose, cane sugar, and glycerol, it was found that maltose is best in presence of tyrosine, glycine, hippuric acid, creatine, or leucine; sucrose is the best form of carbonaceous food when asparagine is present to supply nitrogen.

The mould grows in both acid and alkaline media.

Fats are slowly decomposed by *Monilia* into glycerol and fatty acids. Gelatin is liquefied by the mould both in alkaline and slightly acid condition. Starch, dextrin, sucrose, and maltose are hydrolysed, whilst lactose remains unchanged; cellulose is converted into a reducing sugar. The carbohydrates undergo still further changes, as the mould produces alcohol and various esters.

An enzyme, which the author terms *maltoglucase*, is exclusively and very unequally secreted when the mould is supplied with certain carbohydrates. It is not secreted when the carbonaceous food supplied is, for instance, glycerol; in glycerol, the amylolytic enzyme is found and this produces dextrose from starch. This shows that Duclaux's view is incorrect, namely, that when dextrose is produced by enzymes from starch, maltose is first formed, the maltose being converted by a second enzyme into dextrose. Maltoglucase is secreted in large quantities when raffinose, maltose, commercial dextrin, or starch is present; it is also secreted in presence of cellulose, galactose, xylose, and sucrose.

The secretion of maltoglucase is affected, not only by the nature, but by the amount of the food present. The author's results do not accord with the view that the secretion of enzymes generally is a result of the want of certain nutrients, and that it indicates a condition of hunger of the cell.

N. H. J. M.

Chemical Composition of the Pollen of the Sugar Beet. By ANTON STIFT (*Chem. Centr.*, 1901, i, 903—904; from *Oesterr. Zeit. Zuck. Ind. Landw.*, 30, 43—54).—The dry substance obtained from the pollen of the sugar beet was found to contain 3.6 per cent. of nitrogen, of which 2.6 was present as proteid nitrogen, 0.12 as ammonia, 0.4 as amino-acids and 0.14 as organic bases. Asparagine and glutamine could not, however, be detected. The ethereal extract (5.47 per cent.) probably contained very little fat, but considerable quantities of colouring matter and 1.57 per cent. of lecithin were

present. The composition of the pollen not only resembles that of animal semen in containing lecithin, but also in containing sodium chloride. 0·82 per cent. of starch and dextrin was also extracted from the pollen. Only a very small quantity of sucrose, however, was detected, but the pollen contained 0·52 per cent. of oxalic acid, present mainly as calcium oxalate with some alkali oxalate or free acid. Other organic acids are probably also present.

A comparison of the composition of this pollen with that derived from beet of different origin and locality shows considerable differences, especially in regard to the quantity of non-proteid nitrogen, ethereal extract, pentosans, and ash.

E. W. W.

Migration of Nitrogenous Substances and Ternary Substances in Annual Plants. By GUSTAVE ANDRÉ (*Compt. rend.*, 1901, 132, 1058—1060).—The plants selected were *Sinapis alba* as representing plants of rapid growth, with oily seeds, and *Lupinus albus*, which is of less rapid growth, and has highly nitrogenous seeds. Total nitrogen, amide nitrogen, fat, carbohydrates soluble in water (calculated as dextrose); saccharifiable carbohydrates (calculated as dextrose), and insoluble cellulose were determined in the seeds, in (1) the young plants and at the beginning of the flowering period (2), when the plants were in flower (3), and at the end of the flowering period (4).

In the case of *Sinapis*, the soluble nitrogen represented less than one-fourth of the total nitrogen in the first period, but increased to about one-third in the second period, being more abundant in the stems than in the roots. The absolute amount then diminished, but in the fourth period the soluble nitrogen represented 38 per cent. of the total for the whole plant, and about one-half of the total nitrogen of the fruit.

Similar results were obtained with lupins, which, however, contained high proportions of soluble nitrogen in the roots and stems, even during the period of maturation.

As regards ternary substances, it was found that whilst in *Sinapis* there was a decrease of soluble sugars in the roots, stems, and leaves during growth, there was a regular increase in the case of lupins.

N. H. J. M.

Migration of Ternary Substances in Annual Plants. By GUSTAVE ANDRÉ (*Compt. rend.*, 1901, 132, 1131—1134. Compare preceding abstract).—The roots of *Sinapis* contained nearly the maximum amount of saccharifiable carbohydrates (22·79 per cent.) at the beginning of the flowering period, the amount increasing to 25·74 per cent. at the end of this period; the percentage amounts in the stems were 14·69 and 26·27 respectively in the two periods. The insoluble cellulose in the stems increases less rapidly. In lupins, the saccharifiable carbohydrates remained almost the same (21—22 per cent.) in the stems, but increased in the roots and diminished in the leaves, and the amount in the leaves is much greater than in the case of *Sinapis*.

After extracting vegetable matter successively with light petroleum, dilute alcohol, hot dilute acid, treating with a cold mixture of sulphuric acid (53 c.c.), water (25 c.c.), and hydrochloric acid (23 c.c.), and then,

after dilution with water, boiling for 24 hours, a residue was obtained which contained C 60·28 and H 5·80 per cent. (Frémy's vasculose contains C 59·34 and H 5·49 per cent. ; Lange's lignin contains C = 59—61 per cent.). The substance is practically absent in seeds of *Sinapis*, and is present only in small amounts in the young plants, but the amount increases in all parts as the plants develop. In the portions where vasculose and saccharifiable carbohydrates occur in small amounts, proteids are abundant. It is probable that saccharifiable carbohydrates are chiefly utilised in the production of proteids, and not in forming vasculose.

N. H. J. M.

Quantity of Pentosans contained in Fruits and Vegetables. By CARL WITTMANN (*Chem. Centr.*, 1901, i, 959 ; from *Zeit. landw. Vers. Wes. Oest.*, 4, 131—139).—The quantity of pentosans contained in a large number of fruits, vegetables, fungi, &c., has been determined by Tollens and Krüger's modification of Counciler's method. The results are discussed and tabulated in the original paper. E. W. W.

Pentosans of Jute, Luffa, and Brewers' Grains. By A. SCHÖNE and BERNHARD TOLLENS (*J. Landw.*, 1901, 49, 21—28).—Wheeler and Tollens (*Annalen*, 1889, 255, 327) obtained only about 0·7 per cent. of pure xylose from jute, whilst according to estimations by the authors, jute contains 17 per cent. of pentosans. Similarly, C. Schulze and Tollens (*Abstr.*, 1892, 1420) obtained only 1 per cent. of xylose from luffa, and about 5 per cent. from straw, the estimated amounts of pentosans in the latter substance being about 24—26 per cent.

The low yields of pentoses are partly due to decomposition during the process of heating with acid. Whilst the direct estimation of pentosans in jute showed a percentage of 12·70 of xylan, corresponding with 14·43 per cent. of xylose, determinations in the solutions obtained by heating jute at 100° with 3 per cent. sulphuric acid, and at 125—128° with 1 per cent. acid gave 10·35 and 10·97 respectively as the percentages of xylose. By extracting the wood gum from jute and converting it by Counciler's process (*Chem. Zeit.*, 1892, 1719) into xylose, 1·2 per cent. of xylose, $[\alpha]_D + 19·2^\circ$, was obtained, whilst by heating the jute with 1 per cent. sulphuric acid at 125—128°, the yield was 0·95 per cent. By the latter method, luffa yielded 0·63 per cent. of pure xylose, $[\alpha]_D + 17·9^\circ$.

Dry brewers' grains when heated on a water-bath with 3 per cent. sulphuric acid, yielded a solution which was found to contain 24·77 per cent. of pentosans (= 28·16 per cent. of pentoses). The solution contained 29·08 per cent. (of the grains) of reducing glucoses, which was only increased to 29·50 per cent. by heating with hydrochloric acid.

N. H. J. M.

A Reserve Carbohydrate, which produces Mannose, from the Bulb of Lilium. By J. PARKIN (*Proc. Camb. Phil. Soc.*, 1901, 11, 139—142).—The bulb-scales of the genus *Lilium* contain, in addition to starch, a reserve carbohydrate which exists as a sort of mucilage in the cell-sap of all the parenchymatous cells. It swells up and dissolves in water ; alcohol precipitates and hardens it, so that

sections of scales preserved in spirit show each cell filled with a solid block of mucilage, in which the starch grains are imbedded. It was obtained, by extraction with cold water and precipitation with strong alcohol, as a translucent, almost colourless, tough solid; it gives no marked colour with iodine; it appears to be dextrorotatory. When it is hydrolysed with 2 per cent. sulphuric acid, it yields a sugar which was identified as mannose by means of its cupric reducing power, rotation, and its phenylhydrazone; the original carbohydrate may be identical with the mannan of previous observers. It was obtained from *Lilium candidum* and *L. auratum*; probably the same carbohydrate exists also in *L. bulbiferum*, *L. croceum*, *L. dauricum*, *L. lancifolium*, *L. longiflorum*, and *L. Martagon*. C. F. B.

Proteids of Seeds. By THOMAS BOKORNY (*Bied. Centr.*, 1901, 30, 261—263; from *Bot. Centr.*, 1900, 82, 289—306).—The proteids soluble in 5—10 per cent. salt solutions are stored in the protein grains and albumin crystals; proteid insoluble in sodium chloride solutions was not usually found in protein grains. Fat was never detected in protein grains and is probably uniformly mixed with the plasmatic albumin. Active proteid could not be detected in protein grains. The whole of the proteid residue of the seed tissues, after extracting the protein grains, dissolves in aqueous potash. The gluten substances of cereals dissolve in cold or hot 70—80 per cent. alcohol, a solution used in other cases for precipitating proteids.

Peptones could not be detected in resting seeds. Propeptone (albumose) was sometimes found in traces, and may have been produced by the boiling in presence of acetic acid.

Asparagine, tyrosine, and leucine, which are widely distributed in seeds, seem to be the last intermediate products in the formation of proteids as well as the first decomposition products. N. H. J. M.

Voandzia Subterranea. By BALLAND (*Compt. rend.*, 1901, 132, 1061—1062).—*Voandzia subterranea* (*glycine* or *haricot pistache*) is a widely distributed, leguminous plant cultivated by negroes in the intertropical portions of Africa. The fruit is a pod with seed which ripens in the soil like the earth-nut. The seeds have the following percentage composition:

Water.	Nitrogenous matter.	Fat.	Starchy matter.	Cellulose.	Ash.
9.80	18.60	6.00	58.30	4.00	3.30

On the assumption that the human organism requires daily 120—130 grams of nitrogenous matter, 56 grams of fat, and 500 grams of carbohydrate, it will be seen that, allowing for coefficients of digestibility, 1 kilogram of the seeds will supply the amounts required of the different forms of food. N. H. J. M.

Sugar as Food for Cattle. By FRANZ LEHMANN (*Bied. Centr.*, 1901, 30, 178—181; from *Hannov. Land. Forstwirt. Zeit.*, 52, No. 48).—In 1885, Lawes and Gilbert showed that for fattening pigs, sugar is equivalent to starch. The results of experiments with sheep made at Göttingen in 1885 gave less satisfactory results; 100 kilos. of sugar were found to correspond with only 82.1 and 88.1 kilos. of carbo-

hydrates in ordinary fattening foods (compare Maercker, *Abstr.*, 1885, 1149, and Henneberg, *ibid.*, 1252). In experiments with bullocks, Holdefleiss obtained an increase of 0.315 kilo. per 1 kilo. of sugar. Maercker's experiments with pigs showed a gain of 0.7 kilo. per kilo. of sugar.

In experiments at Göttingen, 980.5 kilos. of sugar (third product) were fed, resulting in a gain of 317.1 kilos. of live weight. The results are not considered altogether satisfactory, because the rations employed were not the most suitable. It is thought that if, for instance, crushed grain, potatoes, maize, and dairy refuse, &c., had been employed, less satisfactory results for sugar would have been obtained.

Feeding with sugar does not improve the quality of meat. Albert's experiments on this point are open to criticism, otherwise his results would have to be considered unfavourable rather than favourable to the employment of sugar.

N. H. J. M.

Pig Feeding Experiments with Molasses, Peat Molasses and Palm-kernel Molasses at Proskau. By J. KLEIN (*Bied. Centr.*, 1901, 30, 280; from *Milchzeit.*, 1899, No. 12, 13).—Grain (1 kilo.) is equivalent to molasses, or peat molasses (1.25 kilos.), with meat meal (0.125 kilo.); or to palm-kernel molasses (1.21 kilos.) without meat meal. Considerable amounts of molasses may be given if the amount is gradually increased. With pigs 3½ to 8 months old the amount can be increased from 150 to 1275 grams per day, or, in the case of palm-kernel molasses, to 1200 grams. Peat molasses seems to be the best form.

N. H. J. M.

Pig Feeding Experiments with Sugar and Palm-kernel Seed at Proskau. By J. KLEIN (*Bied. Centr.*, 1901, 30, 283; from *Milchzeit.*, 1900, No. 20, 21).—In addition to maize and moderate amounts of milk and whey, the pigs received sugar and palm cake, and palm cake alone respectively. The food did not agree with the pigs, but the results showed that sugar had a distinct effect on the nature of the fat produced.

In a second series of experiments, the milk and whey were omitted, the pigs receiving instead a corresponding amount of meat meal. The results showed that sugar was favourable to fat production. The iodine numbers of the fat were considerably higher in the second series of experiments than in the first.

N. H. J. M.

Chlorine Requirement of Buckwheat. By ADOLF MAYER (*J. Landw.*, 1901, 49, 41—60).—The experiments were instituted owing to very unsatisfactory results obtained when buckwheat had been manured with kainite. In opposition to Nobbe (*Landw. Versuchs-Stat.*, 6, 118, and 13, 398), it is maintained that chlorine is practically of no importance in the cultivation of buckwheat, and that even moderate amounts of potassium salts, which, like the modern so-called kainite, contain several equivalents of chlorine to one of potassium, may cause great injury to the crop.

N. H. J. M.

Plot Experiments at Jersitz-Posen in 1898—1899 and 1899—1900. By MAX GERLACH (*Bied. Centr.*, 1901, 30, 236—238; from *Jahresber. Landw. Versuchs-Stat. Jersitz-Posen*, 1898—1899, p. 44, and

1899—1900, p. 21).—The soil of the plots, which are mostly 160 square metres, contains N, 0.110 ; K_2O , 0.102 ; CaO , 0.710, and P_2O_5 , 0.1555 per cent.

With barley, nitrogenous manure produced a decided increase, and nitrogen as ammonia gave nearly the same increase as nitrate. The percentage of nitrogen was in each case high for brewing barley, but the grain was considered to be good for brewing. In the case of oats, phosphatic manure produced very little effect. In 1898, owing to the dry weather, kainite had very little effect on sugar beet ; but there was no depression in the percentage of sugar even when 8 cwt. was applied.

Nitrogen in the form of ammonia produced no after effect, in the second year, the yield being less than when no ammonia had been applied. There was a slight apparent after effect in the case of nitrate, but this is attributed to inequality in the treatment of the land.

Autumn manuring with ammonium salt had no effect on rye, whilst spring manuring with nitrate increased the yield. N. H. J. M.

Inoculation of the Soil with Alinit. By L. MALPEAUX (*Ann. Agron.*, 1901, 27, 191—206. Compare Abstr., 1900, ii, 498).—Pot and field experiments with oats, maize, and white mustard are described. The results accord with the earlier ones indicating that alinit only acts in soil rich in organic matter by rendering available the insoluble nitrogenous substances present. Consistent results were obtained in the pot experiments, but on a larger scale the results are conflicting, and the conclusion is drawn that alinit has no favourable effect on ordinary arable soil. N. H. J. M.

Estimation of the Manurial Requirements of Typical Soils. By MAX GERLACH (*Bied. Centr.*, 1901, 30, 234—236 ; from *Jahresber. Landw. Versuchs-Stat. Jersitz-Posen*, 1898—1899, p. 30).—Pot experiments were made in which barley, followed by white mustard, was grown in six different soils, containing N, 0.030 to 0.257, and P_2O_5 , 0.012 to 0.173 per cent. The results showed that the amount of available nitrogen was in every case so small that nitrogenous manures were necessary for the first crop. As regards phosphoric acid, only one of the soils was much benefited by phosphatic manure for the first crop ; all six soils required phosphoric acid for the second crop. N. H. J. M.

Conditions of Soil and Water in the Province Rheinhessen in the Rheingau and Taunus. By C. LUEDECKE (*Bied. Centr.*, 1901, 30, 145—168 ; from *Mitt. Landw. Inst. K. Univ. Breslau*, 1899, Heft 2, 45).—Analyses were made of 500 samples of soil and subsoil obtained from different geological layers. Besides determinations of calcium (and in some cases magnesium and carbon dioxide), complete analyses were made of extracts by hot dilute hydrochloric acid. Mechanical separations were made, and the water-holding capacity of the soils was determined. The results are given in numerous tables.

In determining calcium and magnesium, the soil (2—25 grams) was heated at 70° with twice the amount of 10 per cent. hydrochloric acid.

The extracts for determining the total soluble constituents were

prepared by treating the soil (25—50 grams), previously dried at 110° , with sufficient 10 per cent. hydrochloric acid to decompose the carbonates. The soil is then heated on a water-bath with acid of the same strength (twice the weight of the soil). The filtered extract is evaporated to dryness with nitric acid. The different methods employed for the different constituents are those described by Bieler and Schneidewind.

The absorption coefficient for nitrogen was determined in 50 grams of soil which passes through 0.5 mm. sieves (round holes) with 100 c.c. of a solution of ammonium chloride containing 1 c.c. of nitrogen per c.c. The results are calculated so as to show how much nitrogen (in c.c.) at a pressure of 760 mm. at 0° is absorbed by 100 grams of soil from 200 c.c. of solution.

The results of a large number of analyses of river and well waters of the same districts are given in tables. N. H. J. M.

Soil of the Experimental Field of the Royal University of Bremen at Rosenthal. By KURT VON RÜMKE and H. HOFFMAN (*Bied. Centr.*, 1901, 30, 220—224; from *Mitt. Landw. Inst. K. Univ. Breslau*, 1900, Heft 3, 1).—Mechanical analyses of 85 soil samples were made. The chemical analyses were made by Wohltmann's methods (*Abstr.*, 1897, ii, 463), with some modification. Addition of sodium chloride in evaporating the hydrochloric acid extract was found to be unnecessary.

The results of soil analyses are given in tables. The treatment of the field from 1893—1894 to 1897—1898 is described in the original paper. N. H. J. M.

Losses of Nitrogen in Fresh Cow Urine and Cow Dung kept in Thin Layers, Alone and with Straw. By KRENZ and MAX GERLACH (*Bied. Centr.*, 1901, 30, 232—234; from *Jahresber. Landw. Versuchs-Stat. Jersitz-Posen*, 1898—1899, p.26).—Fresh cow faeces kept at 16° on flat plates, alone and with straw, did not lose more than 3.1 per cent. of nitrogen in 10 days. In the case of urine, the greatest loss was 3.5 per cent. in 3 days, and 14.8 per cent. in 5 days. The results of similar experiments with a mixture of faeces and urine showed a loss of 0.9 per cent. of nitrogen in 24 hours; in 3, 5, and 10 days, however, the losses of nitrogen were 11.6, 12.1, and 18.9 per cent. respectively. In presence of straw, the losses of nitrogen in the mixed excrement were slight in the first 24 hours, and amounted to 20.6 per cent. in 10 days.

It was found that when fresh excrement is added to older dung, the production of ammonium carbonate is not quickened as might be expected; the loss of nitrogen in 24 hours was 0.8 per cent., and in 3 days 4.0 per cent. N. H. J. M.

Analytical Chemistry.

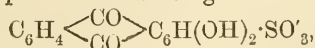
Classification of Acid and Alkali Indicators. By JULIUS WAGNER (*Zeit. anorg. Chem.*, 1901, 27, 138—151).—The author condemns the classification suggested by Glaser (*Abstr.*, 1899, ii, 572) as having no chemical basis and founded only on practical efficiency. A better system is formed when the indicators are classified according to the kinds of ions which they give. Two classes are recognised, each with two sub-groups: A. Indicators with a characteristic univalent ion: (i) with characteristic univalent anion, (ii) with characteristic univalent cation. B. Indicators with polyvalent ion: (i) with positive and negative ion (amphoteric electrolyte), (ii) with uni- and bi-valent anion or cation.

To class A (i) belong amongst others the indicators, iodo eosin, cochineal, fluorescein, alizarin, *p*-nitrophenol, rosolic acid, lacmoid, litmus, and phenolphthalein. The weaker the acid of the indicator the more sensitive is the colour change; but as in this case the degree of hydrolysis is high, the indicator may only be used with strong bases. For the titration of weak bases one of the stronger acid indicators must be employed. The order given is the order of the strengths of the acids contained in the indicator.

Only two indicators are known belonging to class A (ii), namely, methyl-violet and dimethylaminobenzene.

The indicators of class B (i) give different colours in acid and alkaline solution. The substances included in this group are: Tropæolin OO, methyl-orange, ethyl-orange, Congo-red, and benzopurpurin. The action of methyl-orange is discussed at some length and exception is taken to Küster's (*Abstr.*, 1897, ii, 74) interpretation of the intermediate tint obtained with this indicator when the solution contains free carbon dioxide. The explanation offered for this tint is that the acid of methyl-orange is itself reddish; when carbon dioxide is passed into a solution of it, some undissociated acid is formed, and the colour of this along with the yellow of the anion gives the observed tint, which is not a mixture of the red of the cation with the yellow of the anion. (On the ions of methyl-orange, see Bredig and Winkelbach, *Zeit. Elektrochem.*, 1900, 6, 35). A similar explanation is applicable to Congo-red. The sensitiveness of the indicators of this class depends in a large measure on the difference of the colours of the anion and of the cation, and an intermediate tint is always obtained when the undissociated substance is coloured.

In the last class we have those indicators which give differently coloured ions of the same kind. So far only acids of this type are known. Alizarinsulphonic acid which gives the red ion,



and with more alkali the violet ion, $\text{C}_6\text{H}_4 \begin{array}{c} \text{CO} \\ \diagup \quad \diagdown \\ \text{CO} \end{array} \text{C}_6\text{H}(\text{OH}) \begin{array}{c} \text{SO}'_3 \\ \diagdown \\ \text{O}^3 \end{array}$, belongs to this class. Indicators of this type would be useful for

determining phosphoric acid in presence of phosphates, or a weak acid in presence of a strong acid, but no entirely satisfactory one is yet known. J. McC.

Modification of the Manganimetric Method. By J. GAILHAT (*Bull. Soc. Chim.*, 1901, [iii], 25, 395—402).—Volumetric processes involving the use of potassium permanganate are inapplicable in the case of substances undergoing oxidation only at the boiling temperature in acid solution. Under such conditions, the permanganate is itself decomposed, the loss of oxygen being a function of the acidity and of the concentration. A large number of experiments are recorded which show that in the presence of an excess of manganese sulphate (that is, of a quantity containing twice as much manganese as the permanganate employed) and of not more than 20 per cent. by volume of sulphuric acid, the loss of oxygen is practically constant for a time of ebullition ranging from 5 minutes to an hour. Accurate results have thus been obtained in the estimation of glycerol, the substance being boiled with a definite volume of potassium permanganate solution in the presence of sulphuric acid and manganese sulphate, the liquid subsequently titrated with standard oxalic acid, and the result compared with that obtained in a blank experiment carried out under similar conditions. N. L.

New Calcium Chloride Apparatus. By G. F. HENNING (*Zeit. anal. Chem.*, 1901, 40, 168).—This pattern is in the form of an ordinary narrow-necked bottle with two side tubes, that for the entry of the gas being continued inside to the bottom of the bottle, and expanded outside into a bulb. The neck can be closed either by fusion or by a stopper after filling. The apparatus does not require to be suspended, but stands on the balance pan. M. J. S.

Estimation of Ozone. By ALBERT LADENBURG and REINHOLD QUASIG (*Ber.*, 1901, 34, 1184—1188. Compare this vol., ii, 232).—The direct estimation of ozone by weighing affords a check on the methods of estimating this substance volumetrically. By comparing the results obtained gravimetrically with those obtained by absorption in potassium iodide, and subsequent titration of the liberated iodine, it has been found that correct results are only obtained when the gas is passed into neutral potassium iodide solution. The solution is then acidified and titrated with sodium thiosulphate. In this way, the end reaction is quite sharp, and no subsequent liberation of iodine occurs. On the other hand, when the ozone is absorbed by acid potassium iodide solution, the end of the reaction is not sharp, and the amount of ozone found is considerably too high. The reason for this has not been definitely ascertained, but it is possibly owing to the occurrence of the reaction $4\text{O}_3 + 10\text{HI} + \text{H}_2\text{O} = 5\text{I}_2 + \text{H}_2\text{O}_2 + 5\text{H}_2\text{O} + 3\text{O}_2$. A. H.

Estimation of Sulphur in Wrought Iron and Steel. By GEORGE AUCHY (*J. Amer. Chem. Soc.*, 1901, 23, 147—151).—The methods for the estimation of very small quantities of sulphur in steel are still somewhat defective, as the results differ considerably in the third, and often in the second, decimal place according to the process used.

When using the evolution method, the author is now in the habit of adding one-fourth to the amount of sulphur found; thus for instance, 0.012 found is held to indicate the presence of 0.015 per cent.

L. DE K.

Loss of Sulphur in Preparing Ash of Plants. By GEORGE S. FRAPS (*J. Amer. Chem. Soc.*, 1901, 23, 199—206).—Of each of nine different plants, 10 grams were burnt to ash at the lowest possible temperature, and another 10 grams were burnt after addition of 20 c.c. of a solution of calcium acetate containing 29.2 grams of the salt per litre (Shuttleworth's process). Whether the calcium acetate retains all the sulphur or not is still questionable, but when no such addition was made, the loss in sulphur amounted to 4, 28, 6, 100, 16, 11, 68, 58, and 58 per cent. of that found when calcium acetate was used.

L. DE K.

Estimation of Hydrogen Sulphide in Illuminating Gas. By C. C. TUTWILLER (*J. Amer. Chem. Soc.*, 1901, 23, 173—177).—The apparatus consists essentially of a burette provided at the top and bottom with three-way stopcocks and communicating at the top through one of the outlets with a 10 c.c. glass-stoppered cylinder graduated to 0.1 c.c. The enlarged part of the burette holds 100 c.c., and its stem has two graduations, one at the 100 c.c. mark and the other at 50 mm. from the bottom stopcock, dividing the remaining space into two divisions of 5 and 10 c.c. respectively. A mercury level bulb may be connected with the stopcock below.

The stopcocks being made to communicate with the interior of the burette, the gas to be tested, freed from tar if necessary by filtration through cotton, is passed through the burette for a few minutes to displace the air. After closing the burette and waiting for a few minutes, the gas is compressed by raising a mercury reservoir attached to the bottom stopcock until the mercurial column reaches the 100 c.c. mark; by momentarily opening the top, the excess of gas escapes, and exactly 100 c.c. at the ordinary pressure are left. By closing the top, opening the bottom stopcock, and lowering the mercury, the gas is obtained under a reduced pressure, 5 c.c. of starch water very faintly coloured with iodine are introduced, and a standard solution of iodine is added 3 or 4 drops at the time, well shaking after each addition until the starch water assumes a permanent bluish colour. If the solution contains 0.0017076 gram of iodine per c.c., then each c.c. will be equivalent to 100 grains of hydrogen sulphide per 100 cubic feet of gas.

L. DE K.

Detection of Selenium in Sulphuric Acid. By ADOLPHE JOUVE (*Bull. Soc. Chim.*, 1901, [iii], 25, 489—491).—Among the tests for the presence of selenium in sulphuric acid, two are comparatively delicate. The one, based on the production of a blue coloration with codeine (and equally well, it is stated, with morphine), is capable of detecting at most 1 part of selenium in 200, whilst the second, consisting in the precipitation of red selenium by passing a current of sulphur dioxide into the diluted acid, may attain a delicacy of 1 in 10,000. If the selenium is present as selenic acid instead of selenious acid, the

first test is inapplicable, and the second is obtained with difficulty. The use of a current of acetylene as a reducing agent affords a still more delicate test, capable of detecting 1 in 100,000 of selenium; the red coloration is more rapidly produced if the gas contains hydrogen chloride.
N. L.

Estimation of Nitrates in Water by means of Stannous Chloride. By H. HENRIET (*Compt. rend.*, 1901, 132, 966—968. Compare Divers and Haga, *Trans.*, 1885, 623).—The reduction of nitric acid to hydroxylamine by the action of stannous chloride takes place quantitatively when the solution is rendered strongly acid with hydrochloric acid. The residue, obtained by evaporating to dryness 50 c.c. of water, is boiled for 10 minutes with a known excess of stannous chloride and dissolved in concentrated hydrochloric acid; the solution is then titrated with standard iodine solution, the amount of stannous chloride which has disappeared being a measure of the nitrogen present. In this estimation, 6 atoms of iodine correspond with 1 of nitrogen. Organic matter does not interfere with the reaction, but iron salts must be removed by treating the water with ammonia before evaporation.
G. T. M.

Nitrites in Milk. By H. WEFERS BETTINK (*Chem. Centr.*, 1901, i, 854; from *Ned. Tijdschr. Pharm.*, 1901, 13, 67).—Most of the usual tests for nitrites fail when applied to milk; the most delicate is Riegler's, which consists in adding to 10 c.c. of the liquid, 50 mg. of a mixture of equal parts of 1:4-naphthylaminesulphonic acid, and β -naphthol, and then 6 drops of strong hydrochloric acid, and, after shaking for a minute, adding 1.5—2 c.c. of ammonia. Nitrites produce a strong, yellowish-red coloration. Milk should first be coagulated with a few drops of hydrochloric acid, and the filtrate employed. Should a doubt remain whether a feeble colour produced is due to a nitrite, the mixture is filtered, and the precipitate dissolved from the filter by strong alcohol, which will dissolve the red colouring matter, but in the absence of nitrites will at most become feebly yellowish.
M. J. S.

Estimation of the Nitroso-groups in Organic Compounds. By ROBERT CLAUSER (*Ber.*, 1901, 34, 889—895).—Compounds containing a nitroso-group react with phenylhydrazine (1 mol.) forming benzene, water, nitrogen (1 mol.), and (generally) an azo-compound. Directions are given by which the quantitative estimation of the nitroso-groups in a compound can be made by measuring the amount of nitrogen evolved in the reaction with phenylhydrazine. Before measuring the nitrogen, it is completely saturated with benzene, corrections then being made for the tension of the benzene and aqueous vapours.
R. H. P.

Phosphorised Oil. By KONRAD STICH (*Chem. Centr.* 1901, i, 796—797; from *Wien. klin. Woch.*, 14, 177).—Mitscherlich's method will detect 0.0002 per cent. of phosphorus in phosphorised oils if air is occasionally admitted to the distillation tube.
M. J. S.

Estimation of Free Phosphorus in Phosphorised Oils. By ADOLF FRÄNKEL (*Chem. Centr.*, 1901, i, 912; from *Pharm. Post.*, 1901, 34, 117).—Mitscherlich's method, with the modifications of Scherer, and of Nattermann and Hilger (*Abstr.*, 1898, ii, 453) although excellent as a qualitative test, has given in the author's hands only 41 per cent. of the phosphorus taken. The method of Louise (*Abstr.*, 1899, ii, 807) is regarded as inaccurate, since reduction of silver would be produced by the aldehyde in the acetone, by phosphorous acid, and even by certain constituents of cod-liver oil itself. It has also been shown by Nattermann and Hilger that silver phosphide is decomposed by water into silver and phosphorous acid, which latter would escape estimation. The author therefore dissolves the substance in ether, precipitates with a hot alcoholic solution of silver nitrate, oxidises the dried precipitate with aqua regia and estimates the phosphorus as phosphoric acid. Applied to a solution in bitter-almond oil, this method yielded 84—90 per cent. of the phosphorus taken. There is always a loss of phosphorus when preparing solutions of that substance in oils, and a still further loss takes place on keeping. Statements to the contrary by Jolles and Kassowitz were probably based on the above erroneous methods of estimation. M. J. S.

The Effect on the Marsh Test of some Commercial Products containing Selenium and Tellurium. By ALBERT E. BERRY (*J. Soc. Chem. Ind.*, 1901, 20, 322—324).—The mirrors obtained when testing for arsenic in the Marsh apparatus may be totally or partially due to the presence of selenium and possibly of tellurium. To guard against errors, the author suggests the following method. The tubes are treated first with a hot solution of potassium cyanide which dissolves any selenium or sulphur present and leaves the arsenic and any tellurium practically undissolved. On treating the residue with solution of calcium hypochlorite, the arsenic is dissolved leaving any tellurium which can then be fused and further identified. The author has not, as yet, met with tellurium in any commercial products but has frequently met with selenium. L. DE K.

Use of Metallic Sodium in Blow-pipe Analysis. By CHARLES LATHROP PARSONS (*J. Amer. Chem. Soc.*, 1901, 23, 159—161).—A modification of Hempel's method. A piece of sodium, 3 or 4 mm. in diameter, is hammered out flat on a smooth surface, the powdered substance to be tested is spread upon it, pressed into the metal with the hammer and the whole kneaded into a little ball with a knife blade. It is then placed upon a slight depression in a piece of charcoal and ignited with a match or the Bunsen flame. The reduction takes place instantaneously. The residue is now heated before the blowpipe, and as the sodium compounds melt and are absorbed by the charcoal, the fusible metallic particles collect readily into a button and may then be recognised by their behaviour.

The process may be successfully applied to minerals such as galena, cassiterite, chrysocolla, &c. L. DE K.

Quantitative Analysis of Lithiniferous Waters; Comparison of the Spectroscopic with the more Common Methods. By G. RANZOLI (*Gazzetta*, 1901, 31, i, 40—48).—A description of the

various gravimetric methods of estimating lithium in mineral waters is given, and is followed by a discussion of Ballmann's spectroscopic method with the modifications introduced into it by Föhr and by Nasini and Anderlini. Comparative experiments show that the method of the last-named authors gives far more accurate results than any of the gravimetric methods or Föhr's original method.

T. H. P.

Precipitation of Certain Metallic Sulphides with Sodium Thiosulphate. By EDUARD DONATH (*Zeit. anal. Chem.*, 1901, 40, 141—143).—A cadmium or nickel solution (chloride or sulphate) supersaturated with ammonia and then mixed with excess of acetic acid, gives, on boiling for half an hour after addition of powdered sodium thiosulphate, a precipitate containing all the cadmium or nickel, mixed with sulphur. A solution of zinc, cobalt, iron, or manganese, in similar circumstances, gives a sulphur precipitate containing only traces of the metal. The method cannot, however, be employed for quantitative separation since part of the zinc, cobalt, manganese, or iron is always carried down by the other metal. The method can very well be employed for detecting traces of nickel in presence of much cobalt.

M. J. S.

Influence of Pyrites and other Sulphides on the Estimation of Bivalent Iron. By WILLIAM F. HILLEBRAND and HENRY N. STOKES (*Zeit. anorg. Chem.*, 1901, 27, 125—126. Compare Abstr., 1900, ii, 763, and this vol., ii, 284).—An admission of de Koninck's claim for priority (*Ann. Soc. geol. Belg.*, 1882—1883, 10, 101).

J. McC.

Potassium Thiocyanate as Indicator in the Reduction of Ferric to Ferrous Salts. By A. EBELING (*Zeit. öffentl. Chem.*, 1901, 8, 144—145).—The solution containing the ferric salt is mixed with 1 to 2 drops of solution of potassium thiocyanate (1 : 10) which causes a deep red coloration. Dilute sulphuric acid and zinc are added, and as soon as the colour has disappeared showing the complete reduction of the ferric iron, the liquid is titrated, as usual, with standard permanganate.

L. DE K.

Electrolytic Estimation of Bismuth. By KARL WIMMENAUER (*Zeit. anorg. Chem.*, 1901, 27, 1—21).—The author has examined the methods for the electrolytic estimation of bismuth and gives details of his results. An accurate and expeditious estimation is best obtained as follows.

The electrolyte should contain 0.1 gram of bismuth oxide to 1—0.5 c.c. of concentrated nitric acid and if an excess of nitric acid is not employed 2—4 c.c. of glycerol (1 part glycerol to 2 parts water) must be added, and the solution diluted to 150 c.c. When this solution is subjected to electrolysis, using a current of 0.1 ampere at first, and reducing this to 0.05 ampere as soon as any indication of peroxide is detected, a dense, bright deposit is obtained, which is easily washed without loss. It is essential that the electrolyte should be continuously agitated during the deposition. Quantities up to 0.4 gram of bismuth are easily deposited in 3 hours. The temperature of

the solution is gradually raised to 50° and maintained at this until all the bismuth is deposited. The results are within 0.1 to 0.25 per cent. of the theoretical. E. C. R.

Estimation of the Hardness of Water. By MAX PLEISSNER (*Chem. Centr.*, 1901, i, 796; from *Pharm. Centr.-Halle.*, 1901, 42, 145—147).—In estimating the hardness of water by Faisst and Knauss' modification of Clark's method, it is recommended to use a concentrated soap solution, so that in titrating 100 c.c. of water, 1 c.c. shall correspond with 1° (German) of hardness. Such a solution is obtained by dissolving 20 grams of Marseilles soap in dilute alcohol to 1 litre: 100 c.c. of it should be required to give a permanent (5 minutes) lather with 100 c.c. of barium chloride solution containing 0.0436 gram of crystallised barium chloride; 100 c.c. of distilled water require 0.25 c.c. of this soap solution to give a lather. The hardness (x) in German degrees is calculated from the number of c.c. (n) by the formula $x = (10n - 10)/9$. Turbid waters should be filtered; those of more than 20° hardness, diluted. If magnesium is present the 5 minute limit should be adhered to strictly. Organic substances and alumina interfere with the result. M. J. S.

Detection of Alcohol in Milk. By UHL and ORTO HENZOLD (*Chem. Centr.*, 1901, i, 973; from *Milch. Zeit.*, 1901, 30, 181).—On the evidence of the iodoform test, it has been stated that alcohol has been found in milk. A milk distillate which gave the iodoform reaction could not be made to yield ethyl acetate, and, therefore, probably contained an aldehyde derived from the distillation of lactic acid. Aldehydes have been unmistakably obtained from the distillate of milk in which a pure lactic acid fermentation had been established. The proteids of milk also, on distillation with water, yield products which give the iodoform reaction. This reaction cannot therefore be accepted as a proof of the presence of alcohol in milk. M. J. S.

Characteristic Reaction of Phenol. By PAOLO FIORA (*Chem. Centr.*, 1901, i, 843; from *Boll. Chim. Farm.*, 1901, 40, 76).—With peppermint oil, phenol gives a substance of a greenish-blue colour, apparently of the composition $C_6H_5O \cdot CH_2 \cdot C_9H_{17}$, resulting from condensation of phenol with menthol. The colour is not produced by guaiacol, resorcinol, or by creosote. It disappears on heating, but returns with full intensity on cooling if the phenol is in excess, otherwise somewhat more feebly. The reaction is not produced by sodium phenoxide, and it has not hitherto been found possible to employ it for detecting phenol in creosote or in guaiacol. M. J. S.

Positive Indications with the Phenylhydrazine Test in the Absence of Sugar. By ADOLF JOLLES (*Chem. Centr.*, 1901, i, 915; from *Pharm. Post.*, 1901, 34, 120).—Crystals which in appearance and melting point resemble glucosazone are obtainable from urine which contains condensed glycuronic acids or nucleoalbumins. After the removal of these by precipitating with magnesium sulphate, both the phenylhydrazine and the fermentation tests gave negative results.

Albuminous urines often appear to give the phenylhydrazine reaction, although containing no fermentable constituent. Albumin should therefore be separated before applying the phenylhydrazine test.

M. J. S.

A New Sensitive Test for Sugar. By E. RIEGLER (*Chem. Centr.*, 1901, i, 799; from *Deut. med. Woch.*, 1901, 27, 40).—About 1 c.c. of urine is mixed with 0.1 gram of phenylhydrazine hydrochloride, 0.5 gram of sodium acetate, and about 2 c.c. of water, and heated to boiling; 10 c.c. of 10 per cent. sodium hydroxide is immediately added and the mixture shaken. If 0.1 per cent. of sugar is present, the mixture will acquire a reddish-violet colour in about 5 minutes, or in 1 minute if the operation is performed in a basin. Other aldehydes give a similar reaction.

M. J. S.

Scheibler's Extraction Method for the Determination of the Polarisation of Beets. By ALEXANDER HERZFELD (*Zeit. Ver. deut. Zuckerind.*, 1901, 334—335).—The author describes this method as carried out in the laboratory of the Verein der deutschen Zucker-Industrie. In the extraction apparatus employed, the flask consists of two bulbs each holding about 100 c.c. and connected by a short tube about 1 cm. in width, on which is the 100 c.c. (at 20°/4°) mark of the lower bulb. The extractor is that of Müller and allows of a sample of the liquid being removed by means of the stoppered side tube. A short glass Soxhlet's condenser is used. The process is carried out as follows: 26 grams of the beet pulp are weighed out in a nickel basin and well mixed therein with 3 c.c. of lead acetate solution and a few c.c. of 90 per cent. alcohol. The mass is then washed by means of 90 per cent. alcohol into the extractor, the inside end of the siphon tube being covered with a circular piece of wire gauze about 3 cm. in diameter. The pulp is then distributed uniformly in the lower part of the extractor by means of a glass rod which is finally washed with alcohol. The quantity of alcohol taken must be such that the lower bulb is about 3/4 full when all the liquid has passed down by the siphon. After being connected with the condenser, the apparatus is arranged in a rather deep water-bath, so that the alcohol can be kept briskly boiling, the liquid being siphoned off from the pulp at least every 5 minutes and where possible every 3 or 4 minutes. After about 2 hours' extraction, a sample of the liquid is removed from the siphon tube and tested for sugar by the α -naphthol and sulphuric acid test, the extraction being continued until no coloured ring is obtained. When this is the case, the apparatus is disconnected, the contents of the flask are cooled to 20°, made up to the mark with 90 per cent. alcohol, filtered, and the polarisation read off in the ordinary way.

T. H. P.

Evaluation of Gum Arabic. By OTTO FROMM (*Zeit. anal. Chem.*, 1901, 40, 143—168).—The object of this investigation was to obtain comparative values for the adhesive strength of different samples of commercial gum arabic, and to ascertain what connection, if any, existed between the adhesive strength and other properties of the substance which could be ascertained with rapidity and accuracy. Since

it appears from the researches of Dalén (*Mitt. K. tech. Versuchsanstalt*, 1894, 149) that the relative adhesive strength of different samples is not constant with different strengths of solution, all the experiments were made with solutions of the same sp. gr. (1.035 at 15°/15°), which corresponds with 8.5 per cent. of dry, or 10 per cent. of air-dry, gum. The solutions were filtered through cotton wool, and the opportunity taken of observing their colour and tendency to froth, as well as the bulk of the slimy and other insoluble substances. The proportion of slimy matter seems to have an important connection with the so-called "ripeness" of the gum; the comparative amount was estimated by rinsing it from the filter into a graduated cylinder and reading the bulk after subsidence for one night. The viscosity of the solution was estimated with an Engler's viscosimeter at 20°, and compared with water of the same temperature. The value approximates to 2, wide deviations from that number being rare. The acidity is easily estimated by titration with *N*/10 alkali, using phenolphthalein as indicator. The acidity of the solution increases on keeping, both in closed and open vessels, rising more than 50 per cent. in less than a month; the viscosity during the same time undergoes a quite inconsiderable diminution. The optical rotation of the solution was measured in a 1 dm. tube. Most of the samples showed negative rotation, the value α_D lying between -2° and -3° , but a few gave dextrorotation, and a considerable number were almost inactive. Reducing substances were always present, but the amount was small and showed no connection with the optical behaviour. With few exceptions, the solutions gave a thick precipitate with lead acetate.

The direct estimation of the adhesive strength was carried out by the method of Dalén, which consists in saturating porous paper with the gum solution, drying, and ascertaining the increase in the resistance to a rending strain by means of a Schopper apparatus. Numerous precautions are essential, an important one being that the strip of paper must be dried in air which is 65 per cent. saturated with moisture. A special drying chamber was devised for this purpose. The method of stating the results was that which is now usually adopted for expressing the strength of paper itself, namely, the length of the strip of paper which would cause fracture by its own weight, the absorbed gum being regarded as though it formed a separate film of the area of the paper employed. The mean increase in the breaking load recorded by the testing machine was therefore multiplied into the length of the strip of paper (18 cm. \times 15 mm.) and divided by the weight of dry gum absorbed. Values up to 15 kilometres were obtained.

A comparison of all the results showed that gums of high adhesive strength exhibited high viscosity of solution, high acidity, and high lævorotation, and that a considerable deviation from the mean value in any one of these factors is always connected with inferiority in adhesive strength. The following limits are laid down. The solution of specific gravity 1.035 should have a viscosity of at least 2 at 20°; in a 1 dm. tube, it should show negative rotation of at least $2^\circ 30'$; 50 c.c. of the solution must require for neutralisation at least 2.1 c.c. of *N*/10 alkali; it must be precipitated by lead acetate, and reduce

only a small amount of copper solution; its breaking length will then exceed 14 kilometres, and its elongation at breaking strain 2 per cent.

The interesting question is raised how far gum arabic retains these properties on keeping. In some cases, no change could be detected after 5 weeks, but in other cases a distinct deterioration in adhesive strength, accompanied by diminished viscosity and acidity, with increase in the insoluble slimy substances, was observed in that time. This subject will be followed up further. M. J. S.

New Method of Detecting Acetic Acid in Urine. By S. LIPLIAWSKY (*Chem. Centr.*, 1901, i, 801; from *Deut. med. Woch.*, 1901, 27, 151).—The author modifies Arnold's method (*Abstr.*, 1900, ii, 113) as follows. After proceeding as far as the addition of 10 or 12 vols. of concentrated hydrochloric acid, he further adds to 15 or 20 c.c. of this mixture 3 c.c. of chloroform and 2—4 drops of ferric chloride solution. As little as 1 part of acetic acid in 40,000 communicates a characteristic violet coloration to the chloroform, which in the absence of acetic acid remains yellowish or feebly reddish. The reaction is not prevented by ordinary therapeutic preparations. M. J. S.

Estimation of Lactic Anhydride in Lactic Acid. By R. KUNZ (*Chem. Centr.*, 1901, i, 791—792; from *Zeit. Oesterr. Apoth. Ver.*, 39, 186).—A 2 per cent. solution of the substance is neutralised with *N/2* sodium hydroxide, using phenolphthalein as indicator. The alkali consumed corresponds with the lactic acid present and the carboxyl group of the anhydride, $\text{OII} \cdot \text{CHMe} \cdot \text{CO} \cdot \text{O} \cdot \text{CHMe} \cdot \text{CO}_2\text{H}$. An excess of the alkali is then added, and the mixture heated for 5 minutes in the water-bath. This converts the anhydride into sodium lactate. The unconsumed alkali is then titrated by adding an excess of *N/2* sulphuric acid, warming to expel carbon dioxide, and titrating back. From the first titration there is then subtracted a quantity of alkali equal to that consumed in the second; the remainder gives the lactic acid. Examination of numerous commercial samples shows that they are to a large extent dehydrated, and that the proportion of lactic acid may vary widely without the density being much affected.

M. J. S.

Detection of Salicylic Acid in Wine and Beer. By A. CARDOSO PEREIRA (*Bull. Soc. Chim.*, 1901, [iii], 25, 475—476. Compare this vol., ii, 207).—The author confirms the existence in genuine wines of a substance resembling salicylic acid in its reaction with ferric chloride. The substance is contained in much larger quantity in the marc, from which it is proposed to isolate it.

N. L.

Detection of Boiled and Unboiled Milk. By F. UTZ (*Chem. Centr.*, 1901, i, 799—800; from *Pharm. Centr. Halle*, 1901, 42, 149).—The observation of Breteau (*J. Pharm.*, [vi], 7, 569) that the detection of boiled milk by guaiacum tincture is untrustworthy is confirmed. Rubner's method may be used, but Schaffer's (*Schweiz Woch. Pharm.*, 38, 15) is excellent. To 10 c.c. of the milk, 1 drop of a 0.2 per cent. solution of hydrogen peroxide and 2 drops of a 2 per cent. solution of *p*-phenylenediamine solution are added, and the mixture is well shaken.

Unboiled milk immediately becomes blue. Sour milk must first be neutralised with lime water. Buttermilk gives the richest colour, cream gives a greyer blue, whey a violet. Milk which has been heated for a short time at 90° , or a longer time at 70° , does not exhibit the reaction. Traces of formaldehyde delay, larger quantities altogether prevent, the production of the colour; so does an excess of tartaric acid. Ammonium chloride and carbonate have no such effect. M. J. S.

The Guaiacum Test in Practice. By FRIEDRICH GLAGE (*Chem. Centr.*, 1901, i, 861; from *Zeit. Fleisch. und Milchhyg.*, 1901, 11, 162).—According to Ostertag, Arnold's guaiacum test is a trustworthy one for distinguishing between boiled and unboiled milk, and is habitually used in Hamburg during the prevalence of foot and mouth disease. The failure to obtain a blue colour is, however, no proof that the official requirements have been complied with, since these prescribe heating the milk to at least 90° for a quarter of an hour, whilst the test gives a negative result after heating to 80° . The production of a colour is, however, a proof of insufficient heating.

All specimens of tincture of guaiacum do not give the reaction; out of 60 samples tested, less than a third were found suitable. The fitness of the reagent must therefore be ascertained, both at the outset and from time to time. M. J. S.

Calculations Employed in the Analyses of Skimmed and Diluted Milk. By ÉMILE LOUISE and RIQUIER (*Compt. rend.*, 1901, 132, 992—995).—Contains a series of mathematical formulæ applicable to the analysis of sophisticated milk. G. T. M.

Analysis of Sour Milk; Preservation of Milk for the Purpose of Analysis. By A. DUBOIS (*Rev. Intern. Falsif.*, 1901, 14, 42—43; from *Bull. Soc. Pharm. Bordeaux*).—The bottle containing the sour milk which should not have passed beyond the stage of lactic fermentation is heated at 35 — 40° in order to melt the separated fatty matter when it is well shaken. A 200 c.c. flask is taken and milk and water, about 10 c.c. of each alternately, are introduced until the flask contains 100 c.c. of water and 99 c.c. of milk; after thoroughly shaking, a drop of ether is added to destroy the lather, and a few more drops of milk are added to complete the 200 c.c. The author calls this "lait dédoublé." *Specific gravity.* This is taken in a 50 c.c. bottle. From the weight of the milk is deducted 25, and the difference is multiplied by 0.04, which gives the sp. gr. of the original sample. *Acidity.* Twenty c.c. of the mixture are titrated with $N/10$ alkali using phenolphthalein as indicator, and the result calculated to lactic acid. *Lactose.* To 20 c.c. of the mixture are added 3 c.c. of a 5 per cent. solution of sodium metaphosphate and 5 c.c. of hydrochloric acid; after making up to 100 c.c. with water, the filtrate is titrated in the usual way with Fehling's solution. To the percentage of lactose should be added that of any lactic acid in excess of 0.17 per cent. *Casein.* Denigès' process is recommended. *Fat.* Ten c.c. of the mixture are mixed with 1 c.c. of ammonia and 25 c.c. of Adam's ammoniacal ether-alcohol mixture and treated in the same manner as fresh milk. *Total solids.* Twenty c.c. of the mixture are dried in a flat-bottomed

platinum dish on the open water-bath to constant weight. To this is added the weight of the lactic acid; no further corrections need then be applied. *Human milk.* The foregoing applies to human milk except that it is not necessary to dilute in this case. *Preservation of samples.* After several trials, the author now recommends a solution of 50 grams of crystallised phenol in 10 c.c. of alcohol of which 5 c.c. are sufficient to preserve a litre of milk for about 6 weeks. L. DE K.

Composition of Dutch Butter. By JOHN CLARK (*Analyst*, 1901, 36, 113—117).—The paper contains further evidence that the deficiency of Dutch (Friesland) butter in volatile acids, particularly during the months of September, October, and November, is due to natural causes (compare Kirchner and Racine, and Reicher, this vol., ii, 137 and 292). L. DE K.

Halphen's Reaction for Cotton-seed Oil and the Behaviour of some American Lards toward the Same. By PAUL SOLTSIEN (*Zeit. öffentl. Chem.*, 1901, 8, 140—143).—The author has prepared lard from the fatty tissues of two young pigs killed in Chicago, which had been largely fed on cotton-seed meal. These lards gave such a strong reaction with Halphen's sulphur test that they might have been supposed to contain 25 per cent. of cotton-seed oil. They further gave a decided Bechi test and a strong reaction with nitric acid, but gave no reaction with Welmans' phosphomolybdate test. The only proof that they contain no cotton-seed oil was in the fact that they did not yield crystals of phytosterol.

If a lard of unknown origin should give no reaction with Halphen's reagent it may be assumed to be free from, or to contain less than, 0.2 per cent. of cotton-seed oil. But if a reaction is obtained a sample should not be condemned unless there is an indication of the presence of phytosterol. L. DE K.

Heat of Combustion as a Factor in the Analytical Examination of Oils; Heats of Combustion of some Commercial Oils. By H. C. SHERMAN and J. F. SNELL (*J. Amer. Chem. Soc.*, 1901, 23, 164—172).—A table is given showing the heat of combustion per gram (at constant volume and at constant pressure) of 3 samples of raw and 1 of boiled linseed oil, 1 of poppy-seed oil, 3 of maize oil, 6 of cotton-seed oil, 1 of sesamé oil, 3 of rape-seed oil, 2 of castor oil, 1 of peanut oil, 2 of almond oil, 2 of olive oil, 2 of menhaden oil, 2 of cod-liver oil, 1 of whale oil, 4 of lard oil, 1 of sperm oil, 1 of rosin oil, and 3 samples of lubricating petroleum.

The heats of combustion were determined in the Atwater-Blakeslee bomb. The oil was absorbed on a small piece of fibrous asbestos, and ignited directly by the electrically fused iron wire. The whole operation may be finished within an hour. It was found that the heat of combustion is seriously diminished by exposure and oxidation of the samples, which renders it valuable in the technical analysis of oils in conjunction with the other data usually obtained. L. DE K.

A Comparison between the Bromine and Iodine Absorption Figures of Various Oils. By HERMANN T. VULTE and LILY LOGAN (*J. Amer. Chem. Soc.*, 1901, 23, 156—159).—The authors have

redetermined the iodine absorption (Hübl) and the bromine absorption (McIlhiney, Abstr., 1900, ii, 178) of a number of oils and the figures expressed in iodine are given in a table. In some cases there is a fair agreement, but in others the figure calculated from the bromine absorption is greatly in excess of the direct iodine number. The average difference in the case of sweet almond oil was 1.08, of lard oil 1.22, of sperm oil 2.422, of rape oil 4.60, of castor oil 8.01, of seal oil 9.765, of cod-liver oil 10.08, of menhaden oil 10.822, and of rosin oil 48.845.

The average bromine substitution figures of cod-liver oil, menhaden oil, sweet almond oil, sperm oil, castor oil, and rosin oil, were respectively 0.605, 1.245, 2.145, 2.27, 2.63, and 102.345. The high figure for the almond oil may, perhaps, be due to the fact that the sample was somewhat rancid.

L. DE K.

Optical Examination of Fats and Waxes. By GEORG MARPMANN (*Chem. Centr.*, 1901, i, 1015—1017; from *Chem. Rev. Fett. und Harz. Ind.*, 8, 65).—The index of refraction of a mixture is the mean of the indices of its components, regard being paid to their relative proportions. A mixture of equal parts of two substances, a and b , would therefore have an index of refraction $(\mu_D a + \mu_D b)/2$, and if the index of a is known and that of b unknown, the latter may be calculated from the equation $b = 2(\mu_D a + b) - a$. To obtain the refractive indices of substances such as wax, which would, if alone, require to be observed at 70—80°, to the injury of the apparatus, they may be mixed with an oil of known refraction, obtaining a mixture liquid at 40°, and suitable for examination in the butter refractometer. The various fats and essential oils, such as oil of cloves and of peppermint, give good results as solvents, but alcohol and chloroform do not. The purity of a wax cannot with certainty be inferred from its possessing an appropriate index of refraction, since it is easy to make mixtures of the same refractive index, but gross falsifications with paraffin, stearin, tallow, cocoa-fat, or palm oil can be recognised by the refractometer alone. Genuine bees-wax is, however, a very variable substance. A table of refractive indices accompanies the paper.

M. J. S.

Estimation of Fat in Fodders. By M. JAHN (*Zeit. öffentl. Chem.*, 1901, 8, 137—140).—Instead of the ordinary paper cartridge, the author prefers using a case made of tinned iron, 70 mm. high and 19 mm. wide, the bottom of which consists of brass gauze of 35 meshes to the cm. The latter is covered inside with a piece of filter paper and a thin layer of cotton wool, and after 10 or 5 grams of the material to be extracted have been introduced, another layer of cotton wool is placed on the top and then preferably also another disc of wire gauze. The Soxhlet tube most suitable is one 10 cm. high and 2.3 cm. wide and having an overflow of 8.5 cm. The extraction flask should be of the Erlenmeyer type 10 cm. high, 3.5 cm. wide at the top and 7 cm. at the bottom.

The condensed ether drops straight into the case and not being able to escape sideways, must perforce find its way through the mass. When dealing with substances which contain very little moisture and

yield only a small amount of soluble matter to water or alcohol, a previous drying of the material is unnecessary. L. DE K.

Detection of Alkaloids by Microchemical Methods. By E. Pozzi-Escott (*Compt. rend.*, 1901, 132, 920—921).—Contrary to the statements of Popoff (*Rec. trav. Labr. Toxicologie*, 1891), the picrates of the alkaloids, with the partial exception of strychnine picrate, have no characteristic properties that make them available for the detection of alkaloids by the microchemical method.

C. H. B.

Simple Method for the Detection of Caffeine, and its Practical Application. By ANTON NESTLER (*Zeit. Nahr. Genussm.*, 1901, 4, 289—295).—Tea leaves, when carefully heated, yield a sublimate of caffeine, but no sublimate is obtained from exhausted leaves, as the caffeine is very soluble in hot water.

Suspected leaves are reduced to powder, and a little of the powder is heated between two well-fitting watch-glasses, a drop of water being put on the top glass. The watch-glass is put on a wire gauze, and heated by means of the small flame of a Bunsen micro-burner, this being at a distance of 7 cm. from the gauze. After 5 minutes, the inside of the top watch-glass is covered with minute, oily drops, and when the heating is continued for another 5 or 10 minutes, needles of caffeine will make their appearance if the leaves are genuine, but if they have been exhausted no crystals will be visible. The crystals may be further identified, as directed by Molisch, by moistening the sublimate with a drop of hydrochloric acid, and adding a drop of a 3 per cent. solution of gold chloride. The liquid on being allowed to evaporate spontaneously, deposits very characteristic crystals, easily recognised under the microscope; drawings of these are given.

L. DE K.

Proximate Analysis of Cloves. By A. MCGILL (*Analyst*, 1901, 26, 123—126).—Tables are given showing the percentages of *moisture*, *total volatile matter*, *volatile oil*, *total extractive matter*, *fixed oil*, and commercial classification of 8 samples of Penang and 18 of Amboyna cloves.

The moisture was estimated by exposing 2 grams of the powdered sample for 24 hours over sulphuric acid under a pressure of 60 mm. of mercury. Total volatile matter was determined by heating 2 grams of the sample at 98° for 24 hours in a current of dry air. It was found that the loss is much increased when the sample is first moistened with 25 c.c. of ether, which is then allowed to evaporate spontaneously; after drying at 98°, the mass should be again treated with ether. The total extractive matter was obtained by extraction in a Soxhlet apparatus to constant weight. A check on the volatile oil was attempted, by evaporating the solvent and drying the extract, first at a low temperature, and then at 100°, but it was found to be impracticable.

The volatile oil, which is the most essential constituent, and which should not fall below 14 per cent., was obtained from the difference between the volatile matter and the moisture.

L. DE K.

92

General and Physical Chemistry.

Sensitiveness to Light of Fluorescein, its Substituted Derivatives and the Leuco-bases. By OSCAR GROS (*Zeit. physikal. Chem.*, 1901, 37, 157—192).—The leuco-bases of a number of coloured derivatives of triphenylmethane were found to be sensitive to light, and by the use of coloured glasses it was found that darkening proceeded most rapidly under rose-coloured glass. Addition of salts generally causes an increase of sensitiveness. The bleaching of the dyes themselves was also investigated and found to be associated with absorption of oxygen, and hence most probably to be due to oxidation processes. The effects of substituents on the sensitiveness of the leuco-base of fluorescein were investigated; the nitro-group causes a great increase of sensitiveness, the nitro-compounds examined rapidly oxidising in the dark, whereas with the other compounds little or no action takes place in the absence of light. The presence of the dye itself, if not in too great a quantity, was found to cause in general an increase in the oxidation velocity of the leuco-base. Foreign dyes were also found to accelerate the oxidation of both dye and leuco-base, this action being evident at very high dilutions. It was further found that dyes accelerate also other reactions which are sensitive to light, for example, the reduction of mercuric chloride by ammonium oxalate. Metallic salts have but a slight catalytic action, copper salts being remarkable in causing an increase of sensitiveness in ammoniacal solution and a decrease in acid solutions.

L. M. J.

Band Spectrum of Nitrogen in Oscillatory Spark. By G. A. HEMSALECH (*Compt. rend.*, 1901, 132, 1040—1043).—When a high self-induction is inserted in the circuit, the spectrum obtained by means of a condenser discharge between various metals yields a number of bands which the author had previously considered to be due to nitrogen; the careful measurement of the wave-lengths has now proved this view to be correct, the bands being identical with those obtained at the negative pole of a Geissler nitrogen tube.

L. M. J.

Jahn's Measurement of the *E.M.F.* of Concentration Cells. By R. A. LEHFELDT (*Zeit. physikal. Chem.*, 1901, 37, 308—314).—The *E.M.F.* of a concentration cell may be expressed as a function of the total concentration of the electrolyte at the cathode and anode, the degree of dissociation, and the mobility of the ions (this vol., ii, 4): (1) $E = f_1(C, \gamma, x)$. Nernst's formula (2), $E = f_2(\gamma C, x)$, apparently contradicts this. If we express Ostwald's dilution law by (3), $\gamma = f_3(C)$, then from (1) and (3) we get (2) which shows that Nernst's formula does not contradict but is contained in (1). Jahn by assuming $\gamma = 1$ for dilute solutions is able to calculate the value of γC for other solutions. As, however, (3) is contained in (2), this is necessarily the case, and the agreement between Jahn's values for the dissociation constants signifies nothing. The author regards it as correct only to apply

equation (1), and if the results calculated for γ do not agree with those of (3) then (3) and consequently also (2) do not apply to the electrolyte under consideration. Jahn's results have been recalculated, but it is not possible to draw definite conclusions as to whether Ostwald's dilution law applies rigorously to strong electrolytes. J. McC.

Electric Battery with a Depolariser which is spontaneously regenerated by Direct Reoxidation by the Air. By GEORGES ROSSET (*Bull. Soc. Chim.*, 1901, [iii], 25, 541—543).—The negative pole of the cell consists of a zinc rod immersed in ammonium chloride solution, whilst the positive copper pole is placed in a porous cell containing an ammoniacal solution of copper oxide. The hydrogen liberated at the cathode reduces the cupric to the cuprous compound which, having a lower density, rises to the surface of the liquid and is re-oxidised by the oxygen of the air. The loss of ammonia which occurs in these reactions is replaced by that set free by the action of the ammonium chloride on the zinc. N. L.

Conductivity produced in Hydrogen and Carbon Dioxide by the Motion of Negatively charged Ions. By JOHN S. TOWNSEND and P. J. KIRKBY (*Phil. Mag.*, 1901, [vi], 1, 630—642).—In continuation of previous work (Townsend, this vol., ii, 221), the authors find that the phenomena which characterise the conductivity of air at low pressures are met with also in the case of hydrogen and carbon dioxide. From the results obtained, it is found that the mean free path of an ion is longer than that of a molecule in the following ratios, 4.8 : 1 for hydrogen, 4.6 : 1 for carbon dioxide, 4.3 : 1 for air. It appears that approximately the same energy is necessary to ionise a mol. of carbon dioxide and a mol. of air, whilst less energy is required to ionise hydrogen. J. C. P.

Change of Conductivity with Temperature up to and above the Critical Temperature in Solutions of Salts in Liquid Sulphur Dioxide. Electrolytic Conduction in Gases and Vapours. Absorption Spectra of Solutions of Iodides. By AUGUST HAGENBACH (*Ann. Phys.*, 1901, [iv], 5, 276—312).—Solutions of salts in liquid sulphur dioxide are electrolytes (compare Walden, *Abstr.*, 1900, ii, 10), and retain this property up to and over the critical temperature; that the compressed gas solution thus obtained contains ions is shown by the polarisation. Superheated and saturated vapours above a solution behave in a similar manner. The temperature co-efficients for sodium and potassium iodides, potassium bromide and chloride, are regularly negative for the interval 20—160° except in the case of potassium iodide, which exhibits a maximum of conductivity about 90°. The temperature coefficients become numerically very large towards the critical temperature, but become smaller again above that point. The conductivity of the saturated vapour shows a maximum at the critical temperature. When a closed vessel fitted with electrodes and containing a salt solution in sulphur dioxide is shaken, the needle of the galvanometer swings from side to side if the temperature is below the critical point, but remains steady if the temperature is above

the critical point; the critical temperature of these solutions is thus capable of very exact determination.

Solutions of iodides in liquid sulphur dioxide are generally red, but sometimes yellowish in colour. From the spectroscopic investigation, the author concludes that the salts in solution have an absorption spectrum belonging either to the ions or to the undissociated molecules.

A few experiments with aqueous solutions showed that it is impossible to obtain exact results on the same lines as those indicated above.

J. C. P.

Ionisation of Atmospheric Air. By C. T. R. WILSON (*Proc. Roy. Soc.*, 1901, 68, 151—161).—There is a continual leakage of electricity from a charged conductor suspended in a vessel containing dust-free air. The rate of leak is (1) approximately proportional to the pressure, (2) the same in the dark as in diffuse light, (3) the same for positive and negative charges. The loss of charge per second is the same whether the initial potential is 120 or 210 volts, and is such as would result from the production of about 20 ions of either sign in each cubic centimetre per second in air at atmospheric pressure (compare Geitel, *Physikal. Zeit.*, 1900, 2, 116—119).

J. C. P.

Electro-capillary properties of some Organic Compounds in Aqueous Solution. By A. GOUY (*Compt. rend.*, 1901, 132, 822—824).—If H be the maximum height of the column in the capillary-electrometer and H' the height after the addition of the compound, the value $d = 1000(H - H')/H$ is taken as measure of the lowering of the electro-capillary maximum, and the values were found for a large number of organic compounds at dilutions varying from $M/1$ to $M/1000$. The solutions were not made with pure water but with a decinormal solution of sodium sulphate, although it was found that similar values are obtained with solutions, if sufficiently dilute, of any other electrolyte. It was found that this constant varies very greatly for different compounds, even isomerides, whilst great differences are also obtained for the effect of dilution as, for example, propyl alcohol; $M/1$, 59; $M/10$, 7 :—dextrose; $M/1$, 40; $M/10$, 24. The author hence considers that a further study of this constant should prove interesting and useful. The phenomenon of electro-capillary viscosity was also observed for these organic compounds (see this vol., ii, 83).

L. M. J.

Calculation of Degree of Dissociation of strong Electrolytes. II. By SVANTE ARRHENIUS (*Zeit. physikal. Chem.*, 1901, 37, 315—322. Compare this vol., ii, 144).—In defending the views previously expressed, the author points out that many of the criticisms of Jahn (*Zeit. physikal. Chem.*, 1901, 36, 453) and Nernst (*Zeit. physikal. Chem.*, 1901, 36, 596) are based on misunderstandings of the author's statements.

Making use of the experiments of Loomis (*Abstr.*, 1894, ii, 228) and Hausrath (*Inaug. Dissert. Göttingen*, 1901) with solutions of hydrochloric acid, potassium chloride, and sodium chloride, it is shown that these are in agreement with the author's formula for the calculation of the *E.M.F.* of concentration cells if in this van't Hoff's ionisation

constant i be replaced by the value $1 + \alpha$ found from the conductivity ($\alpha = \mu_v / \mu_\infty$). In the cases referred to, it is therefore justifiable to set $i = 1 + \alpha$; but the author believes that this is not quite general, since cases are known in which i does not diminish with increasing concentration so rapidly as does $1 + \alpha$.

J. McC.

Progressive Change of the Factor i as a Function of the Concentration. By A. SMITS (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 3, 717—722. Compare this vol., ii, 304).—Of the salts previously investigated by the author, potassium nitrate was the only one for which the factor i decreased with increasing concentration. With the boiling point method, it has now been found that the nitrates of sodium, barium, silver, and lead behave like potassium nitrate, whilst in the case of strontium nitrate, i tends to increase with the concentration.

J. C. P.

Vapour Pressure of Ternary Systems. By FRANZ A. H. SCHREINEMAKERS (*Zeit. physikal. Chem.*, 1901, 37, 129—156).—A continuation of previous papers (this vol., ii, 146, 224, 305, 372). In the present paper, the system Liq. + Liq.₂ + Vapour is considered, and the effect of distillation either at constant temperature or at constant pressure. It is shown that, if a pressure maximum exists, the composition of both liquid layers will change during distillation in such a manner as to approximate to those corresponding with the maximum pressure. If a minimum pressure exists, the composition during distillation approaches that of either of the critical liquids, whereas if neither maximum nor minimum exists, the composition approximates to that of the critical liquid which possesses the lower vapour pressure.

L. M. J.

Vapour Pressure of Mixed Crystals of Isomorphous Salts. By REINHARD HOLLMANN (*Zeit. physikal. Chem.*, 1901, 37, 193—213).—It has been previously shown that in some cases the vapour pressure of a hydrated salt is lowered by the union with it of an isomorphous salt to form mixed crystals, and this phenomenon is more fully investigated. The vapour pressures of the salts were obtained by determining the composition of the sulphuric acid solution possessing equal vapour pressure (Müller-Erzbach, *Abstr.*, 1896, ii, 295), and curves are given for vapour pressure against composition of the mixed crystals. The first case examined was that of mixtures of potassium aluminium alum and iron alum; the vapour pressures of the pure salts are respectively 2 mm. and 10.9 mm., whilst for the mixtures, two minima occur at 1.4 mm. and 7.9 mm., and a maximum of 8.1 mm., the latter occurring with crystals of the composition Fe:Al = 2:1. Similar results are obtained when chrome alum replaces the iron alum. With mixtures of magnesium and zinc sulphates, two maxima occur for Mg:Zn = 2:1 and Mg:Zn = 1:1 respectively. In the case of mixtures of copper and manganese sulphates, the results are more complicated owing to the existence of two sets of mixed crystals, and only portions of the curves are obtainable with intervening gaps, whilst similar results are obtained for mixtures of sulphates of zinc and copper, magnesium and copper, zinc and manganese. In all cases,

however, the existence of maxima are indicated. The author considers these maxima correspond with definite double salts, and may be taken as a proof of their existence. The results indicate further that as a general rule the vapour pressure of a hydrated salt is lowered by union with an isomorphous salt.

L. M. J.

Cryoscopic Investigations with Inorganic Solvents. By STANISLAW TOLLOCZKO (*Bull. Acad. Sci. Cracow*, 1901, 1—22. Compare Abstr., 1900, ii, 190).—In order to test Brühl's hypothesis (Abstr., 1899, ii, 10), the author has investigated the dissociating power of antimony trichloride, antimony tribromide, arsenic tribromide, and stannic bromide by the cryoscopic method. A similar investigation has been carried out by Walden (this vol., ii, 11), and by both the hypothesis of a connection between unsaturated character and dissociating power is unsupported. Of the solvents examined, only antimony chloride has a strong dissociating influence on inorganic salts. Arsenic bromide possesses the power also, but in a markedly less degree. The author regards it as possible that the abnormal depression noticed with these solvents may be due to chemical action, and suggests that arsenic triiodide in antimony chloride may give rise to an increased number of active molecules by the following reaction: $\text{AsI}_3 + 3\text{SbCl}_3 = \text{AsCl}_3 + 3\text{SbCl}_2\text{I}$; thus the number of molecules different from the solvent is increased fourfold, and this agrees with the molecular weight (625) calculated from the observed depression of the freezing point.

By addition of bismuth bromide to antimony bromide, of bismuth chloride to antimony chloride, and of antimony bromide to arsenic bromide, the freezing point is raised (similarly to β -naphthol in naphthalene).

At low concentrations, sulphur exists as S_8 and iodine as I_2 in antimony chloride.

The latent heats of fusion have been determined for antimony chloride (13.37 cal.) and for antimony bromide (9.73 cal.). The values for the molecular depression calculated by van't Hoff's formula with these numbers agree well with those found experimentally.

J. McC.

Polymerisation of Organic Liquids. By PHILIPPE A. GUYE and ACHILLE BAUD (*Arch. Sci. Phys. Nat. Geneve*, 1901, [iv], 11, 449—471).—As the experiments of Dutoit and Frederich (Abstr., 1900, ii, 194) have shown that the temperature coefficient of the surface tension is not the same for different liquids, the authors have added further data. The method of determination was similar in nature to that adopted by Ramsay and Shields, the calibration of the capillary being effected by measurement of the elevation of benzene in different parts of the tubes. The following are the results obtained for the density: molecular surface energy, y ; temperature coefficient of molecular surface energy, k ; and complexity coefficient, x (see Ramsay and Shields, *Trans.*, 1893, 1089). Anisole, $d_t = 0.9951 - 0.03896(t - 16.7^\circ) - 0.0656(t - 16.7^\circ)^2$; y (9°) = 803.45, (152.9°) = 482.59; k = 2.358, 2.315, 2.229; x = 0.85, 0.87, 0.92. Phenetole, $d_t = 0.9659 - 0.0396(t - 20.8^\circ) - 0.0733(t - 20.8^\circ)^2$; y (19.2°) = 819.9, (152.4°) = 504.22; k = 2.563, 2.376, 2.370; x = 0.75, 0.84, 0.94. Methylurethane, $d_t = 1.1361 - 0.00107$

($t-55.4^\circ$); $y(55.9^\circ) = 612.47$, (150.9°) = 464.55; $k = 1.564$, 1.557; $x = 1.57$, 1.58. Ethylurethane, $d_{75^\circ} = 1.0336$, $d_{105^\circ} = 1.0031$, $d_{145^\circ} = 0.9600$; $y(65.1^\circ) = 587.81$, (152.6°) = 453.3; $k = 1.500$, 1.537; $x = 1.68$, 1.62. *iso*Propylurethane, $d_{65^\circ} = 0.9961$, $d_{105^\circ} = 0.9575$, $d_{155^\circ} = 0.9068$; $y(65.5^\circ) = 610.0$, (152.4°) = 481.16; $k = 1.488$, 1.494; $x = 1.701$, 1.691. Phenylurethane, $d_{65^\circ} = 1.0770$, $d_{105^\circ} = 1.0423$, $d_{155^\circ} = 0.9968$; $y(63.8^\circ) = 857.09$, (152.8°) = 695.9; $k = 1.382$, 1.810; $x = 1.90$, 1.26. Methyleneethyl ketoxime, $d_t = 0.9385 - 0.0_38814t - 0.0_6428t^2$; $y(13.8^\circ) = 605.4$, (150.4°) = 366.8; $k = 1.746$; $x = 1.33$. Valeroxime, $d_t = 0.8962 - 0.0_389(t-15.6^\circ) - 0.0_618(t-15.6^\circ)^2$; $y(16.2^\circ) = 636.66$, (152.2°) = 401.7; $k = 1.825$, 1.709, 1.727; $x = 1.25$, 1.39, 1.35. Nitrobenzene, $d_t = 1.2075 - 0.0_3845(t-11^\circ) - 0.0_5125(t-11^\circ)^2$; $y(9.4^\circ) = 954.5$, (153°) = 650.8; $k = 2.124$, 2.165, 2.114; $x = 0.99$, 0.96, 1.01. Benzonitrile, $y(8^\circ) = 861.4$, (152.4°) = 561; $k = 2.226$, 2.068, 2.080; $x = 0.93$, 1.04, 1.02. *m*-Cresol, $y(9^\circ) = 840.6$, (153.1°) = 575.1; $k = 2.053$, 1.811, 1.842; $x = 1.05$, 1.26, 1.23. Ethyl acetate, $y(9.5^\circ) = 519.16$, (77°) = 373.0; $k = 2.302$, 2.165; $x = 0.88$, 0.96. Only the lowest and highest values of y are here given, and the first values of k and x refer to the lower temperature intervals.

L. M. J.

The Critical State. By INNOCENTIUS I. KANONNIKOFF (*J. Russ. Phys. Chem. Soc.*, 1901, 33, 197—229).—The author discusses the critical state in relation to van der Waals' equation and from the critical data of a large number of compounds as given by various authors, and from a consideration of their true density (see Abstr., 1900, ii, 134, and this vol., ii, 305) in the critical condition, he arrives at the following conclusions: (1) The critical volume is double the constant b of van der Waals' equation. (2) This constant b depends directly on the true volume occupied by a molecule of the compound, the relation being expressed by the equation: $b = 4 \sqrt{2} \cdot r \cdot d$, where r is Lorenz and Lorentz's constant; $(\mu^2 - 1)/(\mu^2 + 2)d$, and d the theoretical density of the substance. (3) In the critical state, the valencies of carbon and oxygen undergo change, the former element becoming sexavalent, and the latter quadri- and even sexavalent. (4) Under critical conditions, compounds have the same structure and are in the same state as they are in dilute solutions. A table is given showing for a series of 52 compounds the values of the various critical constants and of the constants a and b of van der Waals' equation. T. H. P.

Isochores of Ether from 1 c.c. to 1.85 c.c. By EDOUARD MACK (*Compt. rend.*, 1901, 132, 1035—1037).—The relationship between volume, pressure, and temperature has been completely determined between the limits $v = 1$ c.c. to 1.85 c.c. and $t = 100^\circ$ to 206° . The expression $p = \alpha t + \beta$ at constant volume was found to be valid, the divergences being within the experimental errors. Where comparable, the results are found to agree well with those of Ramsay and Young.

L. M. J.

Relation between Viscosity and some other Physical Constants. By A. BATSHINSKI (*Zeit. physikal. Chem.*, 1901, 37, 214—216).—The author deduces that for all compounds $M^{\frac{1}{2}}G^{\frac{1}{2}}/\eta T' (MR)$,

= constant, where M is the molecular weight, θ the critical temperature, η the viscosity coefficient, and R the specific rotation. The values of the constants are calculated for fifteen organic compounds, comprising hydrocarbons, chlorides, aldehydes, ethers, and esters; they only vary between the limits 37.4 and 41.3. From the mean value 39.5, the author recalculates the critical temperatures, and the values show a close approximation to the experimental numbers.

L. M. J.

Relation between Osmotic Pressure and Osmotic Work. By KONRAD DIETERICI (*Zeit. physikal. Chem.*, 1901, 37, 220—222).—A reply to Noyes (this vol., ii, 87).

L. M. J.

Osmosis across a Membrane of Copper Ferrocyanide. By G. FLUSIN (*Compt. rend.*, 1901, 132, 1110—1112).—The velocity of osmosis was determined for solutions of dextrose, sucrose, amygdalin, antipyrine, and carbamide. This naturally varies with the form and dimensions of the vessel, but when the same vessel is used for different solutions it is shown that the ratio of the osmotic velocities is equal to the ratio of the osmotic pressures of the solutions. No results are obtainable with carbamide inasmuch as it is proved that the copper ferrocyanide membrane is permeable to it.

L. M. J.

Solubility of Gases in Organic Solvents. By GERHARD JUST (*Zeit. physikal. Chem.*, 1901, 37, 342—367).—The object was to ascertain whether there is any relationship between the absorption coefficients of different gases in the same liquids, for instance, whether the order of solubility of various gases is the same in various liquids.

The solubility of carbon dioxide in 44 solvents at 15°, 20°, and 25° has been determined. The lowest solvent power is shown by glycerol, then follows water, whilst methyl acetate dissolves about eight times as much of the gas as water does. The solubility in any homologous series of solvents diminishes with increase of molecular weight of the solvent. In a mixture of equal volumes of benzene and alcohol, or of benzene and chloroform, the solubility is the arithmetic mean of the solubility in the separate constituents. This does not, however, hold for all mixtures.

The solubility of hydrogen, nitrogen, and carbon monoxide has been determined in 17 solvents. The results indicate that if the solvents are arranged in the order of their solvent power for each of the four gases, practically the same series is obtained in each case.

Between 15° and 25°, the solubility of hydrogen, nitrogen, and carbon monoxide increases with rise of temperature; in the case of carbon dioxide, the solubility diminishes as the temperature rises through the same interval.

Connections are drawn between solvent power and other physical constants of liquids.

J. McC.

Theory of Colloidal Solution. By FREDERICK G. DONNAN (*Phil. Mag.*, 1901, [vi], 1, 647—652).—In attempting to explain the different behaviour of crystalline and colloidal substances towards liquid media, the author emphasises the distinction between kinetic-molecular equilibrium and statical equilibrium at the interface of solid and liquid.

Thus, when a crystalline solid is dissolving in a liquid medium, the resultant mechanical force acting inwards on a small volume-element at the interface of solid and liquid, preserves the molar integrity of the mass, even though molecular disintegration is taking place. In the solution of colloidal substances, the author sees a case where, up to a certain point, the forces tending to molecular disintegration are greater than those which tend to preserve the molar integrity; in other words, the molecular adhesion between the liquid medium and the colloid is greater than the molecular cohesion of the colloid itself. It is further assumed that the intermolecular attractive forces fall off more rapidly with increasing distance in the case of the molecular cohesion of the colloid than in the case of the adhesion of the colloid and the surrounding medium. There will therefore be a certain critical dimension at which the disintegration of the colloid will cease (before it reaches the molecular limit), and a two-phase system results consisting of the colloid distributed through the original liquid medium in a state of very fine division. For dimensions of the colloid larger than the critical, its common surface with the surrounding medium will tend to increase, whilst for dimensions less than the critical there will be a positive surface tension.

J. C. P.

Salt Precipitation by Vaporisation of Dilute Solutions. By FREDERICK W. SKIRROW and HARRY T. CALVERT (*Zeit. physikal. Chem.*, 1901, 37, 217—219).—The various cases which may occur during the boiling of a salt solution are considered with the aid of curves representing boiling point against concentration and solubility, that is, concentration against temperature. If these curves intersect, salt precipitation occurs when the conditions represented by the point of intersection are attained. If, however, the curves do not cut, no precipitation occurs, the temperature rising continuously until the melting point of the salt is reached; precipitation may, however, occur by diminution of pressure. The solubility curve may further cut the boiling point curve in two points, in which case precipitation of the salt takes place at the lower point and solution at the higher.

L. M. J.

Velocity of Chemical Reactions. By WILLIAM DUANE (*Amer. J. Sci.*, 1901, [iv], 11, 349—356).—The author describes two new methods of measuring the rate of inversion of sugar. The basis of the first method is the change in the index of refraction accompanying inversion. A tube with plane glass ends (not quite parallel) is divided into two wedge-shaped compartments, one of which is filled with the solution to be inverted, the other with an already inverted solution. Light from an illuminated slit passes through a long focus lens and through the tube just described, and forms a distant image. The movement of this image as the solution is inverted is recorded photographically, and from the curve obtained the velocity constant may be calculated. The results obtained by the author give values for the velocity constant which decrease as the inversion proceeds.

The second method depends on the change of volume accompanying inversion. The solution to be examined fills a spiral tube closed at one end, and connected at the other with a horizontal capillary tube containing a column of mercury to indicate the change of volume.

On the assumption that the change of volume is proportional to the amount of sugar inverted, the velocity constant may be calculated. The values obtained by the author show a tendency to decrease as the inversion proceeds.
J. C. P.

Inversion of Cane Sugar. By HANS EULER (*Ber.*, 1901, 34, 1568—1572).—A reply to von Lippmann (this vol., ii, 89).
J. J. S.

Dynamic Investigation of the Bromination of Aromatic Compounds. By LUDWIK BRUNER (*Bull. Acad. Sci. Cracow*, 1901, 22—59. Compare Abstr., 1900, ii, 647).—The reaction between bromine and benzene is unimolecular and is not affected by excess of benzene. The influence of several bromine carriers has been investigated; many of these act catalytically, chromic chloride and metallic chromium being exceptions. Aluminium salts have the greatest catalysing effect, then follow thallium salts, iron salts, iodine, antimony, and phosphorus haloids. Water also acts as a catalyser, and consequently in bromination its presence is advisable. The series given applies also to the influence of the catalysers on the reaction between bromine and monobromobenzene, but not with nitrobenzene, aniline, or phenol; this shows that the effect of the catalyser is dependent on the nature of the substance to be brominated.

The author discusses the theory of catalysis and brings forward experimental evidence of the formation of an intermediary product in the case of the catalysis by iodine. Iodine monobromide gives more bromobenzene than a mixture of equivalent quantities of bromine and iodine in the same time.

The relative speeds of the quick reactions between phenol, *p*-bromophenol, or aniline and potassium iodide and bromine in aqueous solution have been determined. The author finds that $k_1/k_2 = \{x_1(b-a)/(a-x_1)\} \cdot 1/[\ln.a(b-x_2)/b(a-x_2)]$. . . is constant, where a is the concentration of potassium iodide and of bromine (equivalent), b is the concentration of phenol (or aniline), x_1 is the amount of iodine separated, and x_2 ($=a-x_1$) the amount of phenol brominated. For phenol, $k_1/k_2 = 5$, which indicates that the separation of iodine from potassium iodide by bromine takes place five times as quickly as the bromination of phenol. For aniline, $k_1/k_2 =$ about 2, showing that aniline is more easily brominated than phenol. The author compares the speed of bromination of phenol and of aniline with the velocity of reactions between ions.
J. McC.

Inorganic Ferments. II. Catalytic action of Platinum as affected by Poisons. By GEORG BREDIG and KIKUNAYE IKEDA (*Zeit. physikal. Chem.*, 1901, 37, 1—68. Compare Bredig and Müller von Berneck, Abstr., 1900, ii, 213).—The analogy between the catalytic action of colloidal platinum and that of organic ferments (*loc. cit.*) is followed out, especially in connection with the effect of poisons. The rate of decomposition of hydrogen peroxide in presence of colloidal platinum is extraordinarily influenced by substances like hydrocyanic acid, hydrogen sulphide, and mercuric chloride, even in minute quantities; thus the catalytic effect of a platinum solution is halved by

hydrocyanic acid, even when the concentration of the latter is only 0.0014 milligram per litre. The following substances act as strong "poisons" towards colloidal platinum; hydrocyanic acid, iodine cyanide, iodine, mercuric chloride, hydrogen sulphide, sodium thiosulphate, carbon monoxide, phosphorus, hydrogen phosphide, arsenic hydride, mercuric cyanide, and carbon disulphide; the effect of hydrocyanic acid, carbon monoxide, phosphorus, and hydrogen phosphide is temporary, and the platinum gradually recovers. The following are moderately strong "poisons": aniline, hydroxylamine, bromine, hydrogen chloride, oxalic acid, amyl nitrite, arsenious acid, sodium sulphite, and ammonium chloride. The following are weak "poisons": phosphorous acid, sodium nitrite, nitrous acid, pyrogallol, nitrobenzene, hydrogen fluoride, and ammonium fluoride. Formic acid, hydrazine, and dilute nitric acid intensify the catalytic action of colloidal platinum, whilst dilute potassium chlorate solution, ethyl alcohol, amyl alcohol, ether, glycerol, turpentine, and chloroform have practically no effect.

Blood may act as the catalytic agent in the decomposition of hydrogen peroxide, and from results obtained by Schaer it is seen that the parallelism between the poisoning of blood and of colloidal platinum is quite marked.

The "poisoning" of colloidal platinum by the above-mentioned substances may be due to one of four causes. (1) If it be assumed that for the catalytic decomposition of hydrogen peroxide the presence of oxygen in the platinum is necessary, either dissolved or chemically united (compare Haber and Grinberg, *Abstr.*, 1899, ii, 17), then the effect of reducing substances like hydrogen sulphide, hydroxylamine, and phosphorus is easily understood. (2) The surface of the platinum may be chemically or mechanically changed by the deposition of some layer, such as sulphur from hydrogen sulphide, and calomel or mercury from mercuric chloride. (3) The platinum may be chemically attacked and dissolved, for example, by hydrocyanic and hydrochloric acids. The quantity of platinum present, however, is often far in excess of the "poisonous" substance. (4) The surface of the platinum may be so affected that the potential difference between it and the solution, and consequently its surface tension, may be altered. This might be due to the formation of complex substances (such as H_2PtCy_4), or to the removal of oxygen from the surface of the platinum by carbon monoxide, amyl nitrite, and others of the "poisons." J. C. P.

Inorganic Ferments. III. Catalysis of Hydrogen Peroxide by Gold. By GEORG BREDIG and W. REINDERS (*Zeit. physikal. Chem.*, 1901, 37, 323—341. Compare *Abstr.*, 1900, ii, 213).—A colloidal solution of gold is obtained when a current is passed between gold wires in a dilute solution (0.001 *N*) of sodium hydroxide. The solution has a bluish-violet colour, and contains 1 gram atom of gold in 1360 litres.

The influence of this solution on the catalysis of hydrogen peroxide at 25° has been determined, and the results are, on the whole, similar to those obtained with colloidal platinum solution. In neutral solution, the catalytic effect is very small, but in alkaline solution the decomposition is greatly accelerated. The effect is proportional to the

concentration of the alkali up to a maximum (about $1/64 N$ NaOH), and further increase of alkali diminishes the speed. The influence of gold on the reaction in alkaline solution can still be detected when the concentration of the gold is only 0.0003 mg. per c.c. The acceleration is not proportional to the concentration of the gold.

Electrolytes in general diminish the catalytic action of colloidal gold. Hydrogen sulphide, potassium cyanide, sodium sulphite, and sodium thiosulphate "poison" the solution, but in presence of hydrogen peroxide the gold recovers its catalysing influence. Mercuric chloride, which is one of the strongest poisons for colloidal platinum, exerts the opposite effect on the catalysing power of colloidal gold in alkaline solution. Mercuric chloride alone has no catalysing action, but in presence of colloidal gold in alkaline solution the hydrogen peroxide reduces the mercuric salt to mercury (colloidal), and the acceleration produced by gold and mercuric chloride may be due to the catalysis by mercury, which is probably very great. J. McC.

Catalysis in the Reaction between Hydrogen Peroxide and Hydriodic Acid. By JOHANNES BRODE (*Zeit. physikal. Chem.*, 1901, 37, 257—307).—The influence of various agents on the rate of separation of iodine from hydriodic acid by hydrogen peroxide has been determined. From the results of Noyes and Scott (*Abstr.*, 1896, ii, 158), it is clear that the velocity is directly proportional to the concentration of the hydrogen peroxide and of the iodine ions. Since in the reaction hydrogen ions disappear, it was to be expected that the velocity would be proportional to the concentration of these, and Noyes has formulated the catalytic influence $dx/dt = (k + k'c_H)c_{H_2O_2}c_I$. Experiments with various acids have proved that the ratio between the hydrogen ion concentration and the acceleration is constant, in conformity with Noyes' view that the hydrogen ions only exert a catalytic influence which is proportional to the concentration.

Ferrous sulphate greatly increases the velocity of the reaction, and the increase is almost proportional to the concentration. Ferrous sulphate with sulphuric acid, or with sulphuric acid and sodium sulphate, increases the velocity to a slightly greater extent at low concentrations than ferrous sulphate alone, but as the concentration increases the catalytic influence of the pure salt increases more rapidly than when the mixed catalyser is used. This is probably due to the retrogression of the dissociation of ferrous sulphate on account of the increase of the concentration of the SO_4 ions. Schönbein's observation that ferrous sulphate in neutral solution is a better catalyser than in acid solution has been confirmed.

In acetic or oxalic acid solution, the action of iron ions is greatly reduced. Copper sulphate exerts scarcely any effect on the catalysis, but addition of this salt, even in minute quantity, to ferrous sulphate vastly increases the influence of the latter on the reaction.

Molybdic and tungstic acids enormously increase the velocity of the reaction, thus molybdic acid at a concentration of 1 gram-mol. in 1,000,000 litres more than doubles the speed. The accelerations which these two acids produce in equivalent concentrations are about the same in strongly acid solution. They differ, however, inasmuch

as tungstic acid exhibits the phenomenon of hysteresis. It is probable that the influence of these acids is connected with their power of forming peracids, but it is remarkable that other peracid-forming substances such as sulphuric acid, and boric acid, have no catalytic action.

Ferrous sulphate and molybdic acid, and molybdic and tungstic acids, when mixed, produce an additive influence, but ferrous sulphate exerts a retarding effect on the action of tungstic acid.

In the case of hydrogen ions we have a purely catalytic action, but with other catalysers ("pseudocatalysers") it is not improbable that intermediate reactions take place. Assuming, in the case of molybdic acid, that the velocity of the first reaction is very great compared with that of the second, then the acceleration will be measured by the velocity of the second reaction, which is between permolybdic acid and hydriodic acid. If the latter reaction be of the second order, then its velocity is expressed by $dx_1/dt = k'c_{\text{catalyser}}c_{\text{I}}$. According to the principle of co-existence, we must add to this the velocity of the pure reaction (between H_2O_2 and HI), $dx/dt = kc_{\text{H}_2\text{O}_2}c_{\text{I}}$, and so obtain $(dx + dx_1)/dt = k(c_{\text{H}_2\text{O}_2} + k'/k.c_{\text{catalyser}})c_{\text{I}}$. Or, setting $(dx + dx_1) = dx_2$ and $k'/k = \gamma$, $dx_2/dt = k(c_{\text{H}_2\text{O}_2} + \gamma c_{\text{catalyser}})c_{\text{I}}$. The author finds from experiments with molybdic acid that γ has a constant value, and concludes that the premises are correct, namely, that in the first place hydrogen peroxide oxidises the molybdic acid. The formula apparently does not hold for the catalysis with a mixture of ferrous sulphate and molybdic acid, and this is attributed to the disturbance caused by the free iodine on the equilibrium: $\text{Fe}''' + \text{I}' \rightleftharpoons \text{Fe}'' + \text{I}$.

Incidentally, the author has investigated the distribution of hydrogen peroxide between ether and molybdic acid solutions, and the results show that permolybdic acid is formed in solution, and even at high dilution is not hydrolysed to molybdic acid and hydrogen peroxide. Distribution experiments with iron salt solutions and with tungstic acid solutions have not led to definite results. J. McC.

Catalysis in Concentrated Solutions. By JAMES M. CRAFTS (*Ber.*, 1901, 34, 1350—1361; *J. Amer. Chem. Soc.*, 1901, 23, 236—249). —The author has studied the rate of hydrolysis of certain sulphonic acids (chiefly *m*-xylenesulphonic acid) in solutions containing from 10 to 38 per cent. of hydrogen chloride. The acids were heated in a sealed tube at 100°, and the amount of hydrocarbon separated was noted from time to time. The rule that holds for dilute solutions, namely, that the velocity of the reaction is proportional to the concentration of the catalytic agent, is quite inapplicable in the cases examined by the author; for *m*-xylenesulphonic acid he finds that when the concentration of hydrogen chloride is within the limits 13 and 31 per cent., an increase of 6 per cent. in that concentration leads to a velocity constant four times its previous value. Experiments to be described later extend the application of this rule to other sulphonic acids, and to solutions with less than 13 per cent. of hydrogen chloride. Another remarkable fact is that when a 38 per cent. solution of hydrogen chloride has added to it the half of its weight of zinc chloride, the velocity of reaction is quadrupled. The author doubts whether the term 'catalysis' correctly describes these phenomena, and

hopes to give a new theory of the reaction when the experimental data are more numerous. The study of the behaviour of various sulphonic acids under the above conditions is important, since it may lead to new methods of separating the corresponding hydrocarbons.

J. C. P.

Equilibria in Ternary Systems. By FRANS A. H. SCHREINEMAKERS (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 3, 701—714).—A discussion of some points raised by the author's previous investigation of the system, water-phenol-acetone (*Abstr.*, 1900, ii, 393). In particular, it is shown how the position of the chords of the connodal curve at 56.5° may be determined. Attention is drawn to the fact that, whilst the vapour pressure of water is raised, that of a water-acetone mixture is lowered by the addition of small quantities of phenol. Theoretical considerations show that the addition of a new substance to a binary mixture need not have the same effect as the addition of the same to a simple liquid. Thus the addition of sodium carbonate raises the boiling point of water, but depresses the boiling point of mixtures of water and alcohol, provided that the amount of alcohol exceeds a certain limit.

J. C. P.

Rendering Passive, Passivity, and Rendering Active of Iron. By HENRY L. HEATHCOTE (*Zeit. physikal. Chem.*, 1901, 37, 368—373).—Drawn iron immersed in nitric acid of sp. gr. 1.40 becomes passive, but invariably some of the iron is dissolved. Nitric acid of lower sp. gr., 1.25, can also render iron passive. Electrolytically deposited iron is very quickly made passive in acid of sp. gr. 1.40; and slightly oxidised iron in acid of sp. gr. 1.3 also becomes passive.

Iron maintains its passive state (independently of the method by which this has been brought about) for a considerable time in strong nitric acid; it is, however, slowly dissolved.

The rate at which iron is rendered active in dilute nitric acid is accelerated by stirring, which indicates that this process is of the nature of a solution phenomenon. In a concentrated solution of potassium nitrate, passive iron becomes active in a few seconds; in 2*N* potassium hydroxide solution, the passivity remains for 2—3 minutes, whilst in saturated solutions of potassium dichromate or iron alum the iron may still be passive after several days. Passive iron may be dried and even placed under diminished pressure (7—8 mm.) without becoming active. The *E.M.F.* of a cell consisting of: passive iron | dilute sulphuric acid | iron: shows a gradual fall of potential until about 0.89 volt is reached, when it remains stationary for a moment, then steadily continues to fall. When a current was passed through

the cell, platinum | nitric acid of sp. gr. 1.4 | iron, the needle of the ammeter showed regular oscillations, and the cathode had the appearance of iron dissolved pulsation-wise.

Iron periodically dissolved has a characteristic appearance; the surface is smooth and eaten out at places.

A long rod of passive iron immersed in nitric acid (1.315*N*), when touched under the liquid with zinc, forms an active zone which propagates itself along the rod, continually diminishing in size until it

ultimately disappears and leaves the whole passive. A piece of dry passive iron, when touched with glass or zinc, becomes active only at the spot touched.

The author concludes that the passive state is not due to protection by a film either of liquid or of gas. The passivity of iron does not spontaneously disappear, but only when it is subject to some external exciting influence.

J. McC.

Inorganic Chemistry.

Solubility of Gases in Water. III. By LUDWIG W. WINKLER (*Ber.*, 1901, 34, 1408—1422. Compare Abstr., 1891, 384; 1892, 271).—From data previously obtained (*loc. cit.*) for the solubility of nitrogen and oxygen in water, the absorption coefficient of air at temperatures between 0° and 100° is calculated; its value is 0·02881, 0·02264, 0·01869 at 0°, 10°, and 20° respectively—numbers which are rather larger than those calculated by Bunsen from the solubility of nitrogen and the composition of the air obtained by boiling out water. A table is given showing the volume of air absorbed by 1000 c.c. of water at all temperatures between 0° and 100°. The percentage of oxygen in the air obtained by boiling out water diminishes as the temperature of absorption rises, and may be calculated by the equation, $n = 35·47 - 0·0338t$, where n is the percentage of oxygen and t is the temperature.

The author has also determined the absorption coefficients of nitric oxide, carbon monoxide, methane, and ethane. The following table shows within what limits the values lie:

	Absorption coefficient.	
	At 0°.	At 80°.
Nitric oxide.....	0·07381	0·02700
Carbon monoxide	0·03537	0·01430
Methane	0·05563	0·01770
Ethane	0·09874	0·01826

In the case of carbon monoxide and ethane, the values at the ordinary temperature are higher, in the case of methane lower, than those given by Bunsen. Nitric oxide and carbon monoxide were found to have a slight chemical action on water, and a corresponding correction was introduced in the author's calculations.

J. C. P.

Iodine and the Colour of Iodine Solutions. By WILHELM VAUBEL (*J. pr. Chem.*, 1901, [ii], 63, 381—384).—Solutions of iodine may be divided into two classes, violet solutions, which transmit red and blue light as does iodine vapour, and yellow or brown solutions, which transmit no blue light, but only red, yellow, and green. The solvents of the first class are carbon disulphide, hydrocarbons, and their halogen derivatives, and other halogen containing substances.

Those of the second class are oxygen and nitrogen compounds, alcohols, aldehydes, ketones, ethers, and acids, provided they do not contain halogen. It is noteworthy that a solution in 83 per cent. sulphuric acid is violet, which on dilution to about 66 per cent. becomes yellow.

K. J. P. O.

Simple method for obtaining a Saturated Aqueous Solution of Hydrogen Sulphide or a Constant Supply of the Gas. By F. MOLLWO PERKIN (*J. Soc. Chem. Ind.*, 1901, 20, 438).—The apparatus (of which a figure is given) is so arranged that the space above the liquid in the bottle containing the aqueous solution is always filled with an atmosphere of the gas, which is renewed automatically by a constant generator when either the solution is drawn out for use or the gas allowed to escape. The solution is thus protected from oxidation, and is maintained in a saturated condition.

M. J. S.

Action of Anhydrous Sulphuric Acid on dry Potassium Persulphate. By A. BACH (*Ber.*, 1901, 34, 1520—1522).—The experiments described in a former paper (this vol., ii, 14), were repeated, care being taken to exclude water by using 100 per cent. sulphuric acid throughout, and employing carefully dried potassium persulphate and permanganate; similar results, however, were obtained as before, 1.31 times the calculated volume of oxygen being evolved. This corresponds with a conversion of $\frac{5}{8}$ of the active oxygen of the persulphate into a "higher persulphuric acid" and of $\frac{3}{8}$ into a simple acid, and shows that small quantities of water do not affect the formation of the higher acid, or its decomposition by manganese heptoxide. It is noteworthy that in the anhydrous solution, potassium persulphate gives the titanous acid reaction for hydrogen peroxide, although the latter cannot, under the conditions, be present.

W. A. D.

Preparation of large quantities of Tellurium. By EDWARD MATTHEY (*Proc. Roy. Soc.*, 1901, 68, 161—163).—In obtaining bismuth from its ores, tellurium, if present, must be removed. Treating the alkaline residues containing the tellurium by acidification with hydrochloric acid and precipitation with sodium sulphite, the author has obtained 57½ lbs. of tellurium from 321 tons of ore, the latter containing, on the average, 22.5 per cent. of bismuth. The tellurium has a sp. gr. 6.27; the temperature of solidification is 450°, and the electrical resistance is about 800 times that of copper, but depends largely on the crystalline conditions; the thermo-electric power of tellurium appears to be great.

J. C. P.

Some Physical Properties of Nitric Acid Solutions. By VICTOR H. VELEY and J. J. MANLEY (*Proc. Roy. Soc.*, 1901, 68, 128—129. Compare Abstr., 1898, ii, 277).—The properties examined are the densities, with special reference to the contractions, and the refractive indices. The investigation shows that the physical properties are discontinuous only at points corresponding with simple molecular proportions of nitric acid and water; the best defined points, indicated either by the density or by the refractive index, or by both, are those corresponding with the hydrates with 14, 7, 4, 3, 1.5, and 1 H₂O. A remarkable discontinuity is indicated at concentrations between 95 and

100 per cent., in agreement with the authors' previous determination of the electrical conductivity (*loc. cit.*); possibly this discontinuity may be explained otherwise than by the combination of acid and water. The contractions show that the points of discontinuity are not absolutely sharp, as there is a transition stage, within the limits of 1—2 per cent., in the vicinity of such points.

The specific refraction, calculated both by Gladstone and Dale's, and by Lorentz's formula, decreases with increasing concentration. Pulfrich's formula, expressing the relation between the refractive index and the contraction in terms of a constant, is approximately applicable, but that only for neighbouring concentrations.

J. C. P.

Volatility of Boric Acid in Steam. By FREDERICK W. SKIRROW (*Zeit. physikal. Chem.*, 1901, 37, 84—90).—A large number of unsaturated boric acid solutions have been distilled and the concentration of the acid in the distilling liquid and in the distillate determined. It is found that as the former concentration increases, the latter increases also, but more slowly. On the hypothesis that only one of the hydrates, H_3BO_3 , $\text{H}_2\text{B}_4\text{O}_7$, $\text{H}_2\text{B}_2\text{O}_4$, is volatile, it follows from the results that H_3BO_3 is the volatile form. The lowering of the vapour pressure, however, is less than is in accordance with the above hypothesis, and the author finds that the other hydrates are increasingly formed in the solution with rising concentration. The two following equations would express the equilibria: (1) $4\text{H}_3\text{BO}_3 \rightleftharpoons 5\text{H}_2\text{O} + \text{H}_2\text{B}_4\text{O}_7$; (2) $2\text{H}_3\text{BO}_3 \rightleftharpoons 2\text{H}_2\text{O} + \text{H}_2\text{B}_2\text{O}_4$. The ratio of the H_3BO_3 concentrations in solution and vapour is calculated to be 2.2×10^5 .

J. C. P.

Reduction of Silver Chloride by Hydrogen and the Inverse Reaction. By JOUNIAUX (*Compt. rend.*, 1901, 132, 1270—1272).—Above 600° , the conditions of equilibrium are the same whether the original system consisted of silver and hydrogen chloride or of silver chloride and hydrogen, and the proportion of hydrogen chloride increases with the temperature, and amounts to 95 per cent. at 700° . The value of p is higher the lower the pressure in the tube, both at 540° and at 640° . The experimental values for the conditions of equilibrium agree closely with those calculated from thermodynamical formulæ.

MARCELLIN P. E. BERTHELOT (*ibid.*, 1273) points out that when silver is heated in hydrogen at about 550° , it disintegrates, and undergoes changes in molecular condition with possibly the formation of a hydride, and these changes must be taken into account when considering the conditions of equilibrium of any reaction in which it takes part at high temperatures.

C. H. B.

Reducing Power of Calcium Carbide. By FR. VON KÜGELGEN (*Zeit. Elektrochem.*, 1901, 7, 541—550, 557—568, and 573—580).—When a mixture of lead oxide and calcium carbide is heated, reaction takes place at a comparatively low temperature, the mass becoming red hot. To complete the reaction, it is necessary to heat the mixture to a dull red heat. When the theoretical quantity of calcium carbide

is used, the gas evolved consists entirely of carbon dioxide; with larger quantities of carbide, small quantities of carbon monoxide are also present (compare this vol., ii, 98). Quantitative experiments show that the principal reaction is represented by the equation $5\text{PbO} + \text{CaC}_2 = 5\text{Pb} + \text{CaO} + 2\text{CO}_2$. The change appears, however, to take place in two stages, the first of which is complete at a lower temperature than the second; they correspond with the equations (1) $\text{PbO} + \text{CaC}_2 = \text{Pb} + \text{CaO} + 2\text{C}$ and (2) $4\text{PbO} + 2\text{C} = 4\text{Pb} + 2\text{CO}_2$. The lead obtained contains traces of calcium; when calcium chloride was used as a flux and to prevent oxidation, the lead contained from 0.06 to 0.08 per cent. of calcium; in absence of calcium chloride, 0.12 to 0.2 per cent., according to the excess of calcium carbide employed.

A mixture of lead chloride and calcium carbide undergoes the change $\text{PbCl}_2 + \text{CaC}_2 = \text{CaCl}_2 + \text{Pb} + 2\text{C}$ when it is heated. The reaction may be started by applying the flame of a match to one part of the mixture, it then spreads with almost explosive violence through the whole mass. The carbon which is separated prevents the union of the lead particles to a regulus.

A mixture of lead chloride and lead oxide gives a better result, the high temperature produced by the reaction of the lead chloride and calcium carbide causing the lead oxide and carbon to react. A mixture containing the quantities required by the equation $\text{PbCl}_2 + 4\text{PbO} + \text{CaC}_2 = 5\text{Pb} + \text{CaCl}_2 + 2\text{CO}_2$ could not be ignited, even by a core of the mixture of lead chloride and calcium carbide; a mixture of lead chloride (150 parts), lead oxide (120), and calcium carbide (39.24), however, evolved enough heat to fuse the whole mass, leaving a regulus of 200 parts of lead. The reactions occurring in this case are $\text{PbCl}_2 + \text{CaC}_2 = \text{Pb} + \text{CaCl}_2 + 2\text{C}$ and $4\text{PbO} + \text{C}_2 = 4\text{Pb} + 2\text{CO}_2$.

The results obtained with copper oxide and chloride are very similar to those obtained with the corresponding lead compounds. Copper oxide and calcium carbide react first at about the melting point of silver; the reaction is then very violent. In presence of calcium chloride, the metal contains 0.036 to 0.124 per cent. of calcium; by using a large excess of calcium carbide and no flux, copper containing 1.06 per cent. of calcium was obtained. The reaction between copper chloride and calcium carbide is quite similar to that between lead chloride and calcium carbide, but it is more violent. Owing to this circumstance, a mixture of copper chloride, copper oxide, and calcium carbide in the proportion $\text{CuCl}_2 + 4\text{CuO} + \text{CaC}_2$ reacts with great rapidity when ignited with a match.

The temperature produced by the reaction of copper chloride and calcium carbide is sufficiently high to bring about the reduction of other oxides by the carbon which is formed. The following results were obtained:

Mixture heated.	Composition of alloy formed.
CuCl_2 (5); ZnO (5); CaC_2 (3).	Cu, 86.4; Zn, 13.48; Ca, 0.041.
CuCl_2 (5); SnO_2 (11.65); CaC_2 (2.71).	Cu, 24.47; Sn, 74.84; Ca, 0.037.
CuCl_2 (5); Mn_2O_3 (5); CuO (5); CaC_2 (3).	Cu, 91.02; Mn, 8.88; Ca, trace.

An aluminium bronze could not be prepared in this way. A mixture

of silver chloride with about $1/4$ its weight of calcium carbide reacts quickly when ignited with a match, leaving a button of fused silver. Zinc oxide is reduced at a bright red heat, whilst a mixture of zinc chloride and calcium carbide may be ignited; the zinc produced is, however, in the form of a sponge or powder. From a mixture of zinc chloride, copper oxide, and calcium carbide, almost the whole of the zinc may be obtained as an alloy; this is not the case with the mixture of copper chloride and zinc oxide. By replacing some of the copper oxide in this mixture by nickel oxide, German silver is obtained.

Mercuric oxide and calomel are reduced by calcium carbide, the reactions being accompanied by comparatively small development of heat.

Stannic oxide is reduced incompletely at a bright red heat; with stannous chloride, the reaction does not require external heat, but the tin remains mixed with the slag as a powder. A mixture of the chloride and oxide gives a somewhat better result. A mixture of stannous chloride and copper oxide is very readily reduced by calcium carbide. Arsenious oxide is reduced at a dull red heat. Bismuth oxide, chloride, or oxychloride are readily reduced to the metal without the aid of external heat. Chromic oxide is very incompletely reduced at a bright red heat, chromic chloride reacts without external heat; in both cases, the metal is in the form of powder, and in the second it contains carbon. Molybdic and tungstic acids are reduced at high temperatures, yielding metallic powders. Manganese compounds behave like those of chromium; manganese bronze was, however, readily obtained by heating a mixture of manganese chloride (10 parts), copper oxide (12.1), and calcium carbide (5.78) to a bright red heat with calcium chloride as flux. The bronze contained 10.71 per cent. Mn, 89.36 per cent. Cu, and 0.04 per cent. Ca. Ferric oxide is incompletely reduced at a high temperature; ferric chloride reacts without external heat, yielding a powder of iron. Nickel compounds behave similarly. Potassium and sodium hydroxides are reduced at comparatively low temperatures, hydrogen and carbon monoxide being formed in addition to calcium oxide, metallic sodium, or potassium and their carbonates. Metallic sodium is also formed when sodium chloride is fused with calcium carbide; in presence of lead, it can be isolated in the form of the lead alloy. Magnesium could not be isolated, although the chloride appears to be reduced by calcium carbide. Aluminium oxide is incompletely reduced, the chloride reacts without external heat, yielding a powder mixed with much carbon; in presence of finely divided copper, an alloy containing 2.59 per cent. aluminium was obtained in small quantity. Cerium oxide was not reduced; the chloride yielded some cerium carbide in the form of powder.

T. E.

Magnesium Nitride. By W. KIRCHNER (*Chem. Zeit.*, 1901, 25, 395. Compare Eidmann and Moeser, this vol., ii, 240).—Long, thin magnesium turnings are formed into a coherent mass by being pressed and well hammered in a hollow iron cylinder, and are then ignited by applying a light. The product consists of a solid core of greenish-yellow magnesium nitride with a thin crust of oxide which can readily be removed.

J. J. S.

Rate of Solution of Zinc in Acids. By T. ERICSON-AURÉN (*Zeit. anorg. Chem.*, 1901, 27, 209—253).—The solution of zinc in very dilute acids takes place in two periods; during the first, or induction period, the surface of the zinc becomes covered with bubbles of hydrogen which prevent the contact of the acid with the metal, and, consequently, a relatively small quantity of zinc is dissolved; during the second, or solution-period, the rate of solution gradually increases to a maximum, remains constant for some time, and then gradually decreases. The point at which this maximum is reached is independent of small differences of temperature, but with large variations in the temperature is reached sooner at lower than at higher temperatures. The presence of chlorides in large quantities also causes the maximum to be reached earlier. The rate of solution is determined by local electric circuits and by the direct chemical action of the acid on the zinc, and variations in the composition of the solution either increase or decrease the rate of solution according to their influence on these two phenomena.

At increasing concentrations, the rate of solution in hydrochloric and sulphuric acids is not proportional to the electrical conductivity of the acid, but increases more rapidly, and this increase is proportionally greater for hydrochloric than for sulphuric acid.

The influence of temperature on the rate of solution increases with the concentration of the acid, and with very dilute acid is not appreciable.

Non-electrolytes decrease the rate of solution; the decrease, however, is not proportional to the amount present, but is much greater proportionally for small quantities than for large quantities. In a given acid solution, the presence of an equal number of molecules of different non-electrolytes decreases the rate of solution in an equal degree.

The addition of small quantities of electrolytes (salts) to the acid decreases the rate of solution; on the further addition of the salt, the rate of solution is increased. On the continued addition of a salt, only those salts which produce a maximum electrical conductivity of the solution produce a maximum rate of solution of the zinc.

E. C. R.

Lead Suboxide. By SIMEON M. TANATAR (*Zeit. anorg. Chem.*, 1901, 27, 304—307).—Lead suboxide is obtained by decomposing lead oxalate at as low a temperature as possible in a current of carbon dioxide or nitrogen. It is a greyish-black powder of sp. gr. 8.342 at 18°, is not altered by dry air or by water, and is decomposed into lead oxide and lead by dilute acids and alkalis. One gram-mol. dissolved in acetic acid liberates 10.048 Cal., and since the solution of lead oxide in acetic acid liberates 15.500 Cal., the decomposition of lead suboxide into lead and lead oxide requires 5.452 Cal.

E. C. R.

Specific Gravity of Cuprous Iodide. By WALTÈRE SPRING (*Rec. Trav. Chim.*, 1901, 20, 79—80).—The sp. gr. of dry cuprous iodide is 5.653° at 15°, not 4.41° as stated by Schiff (*Annalen*, 1858, 108, 24); the molecular volume is thus 33.61, and is less than the sum of the atomic volumes of the elements (34.73), showing that, as usual, a contraction has occurred in combination.

W. A. D.

Crystallisation of Copper Sulphate. By ARTHUR J. HOPKINS (*Amer. Chem. J.*, 1901, 25, 413—419).—A discussion of the general conditions which determine the size of crystals, together with a method for the preparation of crystals of copper sulphate of any desired size. Preliminary experiments showed that neither concentration alone, nor the relation of the size of the dish to the volume of the solution, nor the rapidity of cooling, determines the size of the crystals, but that, for a given volume, concentration, and size of dish, it depends on the number of crystal points first started in the solution as it cools beyond the point of saturation. The method for starting any required number of crystal points is as follows. The hot measured solution (containing a little sulphuric acid) is poured into the crystallising dish, which is then carefully covered; it is left for 8—10 minutes to cool, a blast of air, under a pressure equivalent to 12 mm. of mercury, is blown upon the surface, and the latter is watched closely for the first minute crystals which appear. When the proper number of these crystals for the particular volume and concentration is not only formed but persists in the hot solution, the blast is removed and the crystals are left to grow. The mother liquor may be concentrated to the strength of the original solution, and another crop of crystals obtained in the same way. By this means, the author was able to obtain crystals of copper sulphate of 20—30 mm. in length.

E. G.

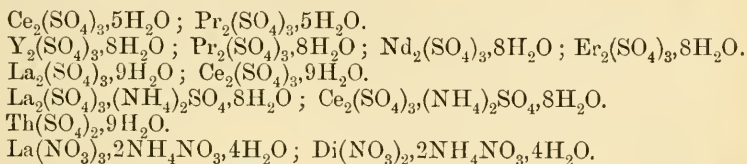
Action of Mercuric Oxide on Aqueous Solutions of Metallic Salts. By A. MAILHE (*Compt. rend.*, 1901, 132, 1273—1275).—The author has investigated the action of mercuric oxide at the ordinary temperature on solutions of certain metallic salts, and has obtained results different from those described by Rose (*Ann. Phys. Chem.*, 1859, 107, 298). Zinc chloride yields a white, crystalline oxychloride, $\text{ZnCl}_2 \cdot 3\text{ZnO} \cdot 3\text{H}_2\text{O}$, whilst the bromide yields a basic double salt, $\text{HgBr}_2 \cdot \text{ZnO} \cdot 8\text{H}_2\text{O}$, in long, monoclinic prisms. Zinc nitrate yields a microcrystalline product, $\text{Hg}(\text{NO}_3)_2 \cdot \text{ZnO} \cdot \text{H}_2\text{O}$. Nickel chloride yields a green oxychloride, $\text{HgCl}_2 \cdot \text{NiCl}_2 \cdot 7\text{NiO} \cdot 10\text{H}_2\text{O}$, and the nitrate a compound, $2\text{Hg}(\text{NO}_3)_2 \cdot 3\text{NiO} \cdot 8\text{H}_2\text{O}$, which crystallises in hexagonal lamellæ. Cobalt chloride yields quadrangular plates of the composition $2\text{HgCl}_2 \cdot 6\text{CoO} \cdot \text{H}_2\text{O}$, and the nitrate yields red, monoclinic prisms of the compound $\text{Hg}(\text{NO}_3)_2 \cdot \text{CoO} \cdot 3\text{H}_2\text{O}$. Cupric chloride yields the amorphous oxychloride, $\text{CuCl}_2 \cdot 3\text{CuO} \cdot 4\text{H}_2\text{O}$, whilst the bromide yields green, quadrangular plates of the basic salt $\text{HgBr}_2 \cdot \text{CuO} \cdot 3\text{H}_2\text{O}$, and the nitrate, blue quadrangular prisms of the compound $\text{Hg}(\text{NO}_3)_2 \cdot \text{CuO} \cdot 4\text{H}_2\text{O}$. All these basic nitrates are somewhat readily decomposed by water. Copper sulphate solution has a slight action on mercuric oxide, but the other sulphates, as Rose stated, have no action.

C. H. B.

Mercurous Nitrite. By PRAFULLA CHANDRA RÂY (*Annalen*, 1901, 316, 250—256. Compare *Trans.*, 1897, 77, 338; *Proc.*, 1896, 12, 218; 1899, 15, 103).—Mercurous nitrite is best prepared by digesting mercury with cold dilute nitric acid of sp. gr. 1.041, and purified by dissolving in hot water and crystallising from this medium.

G. T. M.

Some Salts of the Rare Earths. By E. H. KRAUS (*Zeit. Kryst. Min.*, 1901, 34, 397—431; and *Inaug. Diss. München*).—Previous crystallographic determinations made on salts of the rare earths are not in close agreement, since, on account of the imperfect methods of separation, the material examined was not quite pure. Detailed crystallographic, optical, and sp. gr. determinations are now given of the following salts, mainly hydrated sulphates, and the calculated topic axial ratios are compared:



L. J. S.

Density of Alloys. By EDMOND VAN AUBEL (*Compt. rend.*, 1901, 132, 1266—1267).—An aluminium-antimony alloy, the composition of which corresponds with that required for the formula AlSb , melts at 1078 — 1080° , although aluminium and antimony melt respectively at 660° and 630° . The sp. gr. of this alloy is 4.2176 at $16^\circ/4^\circ$, whereas the sp. gr. calculated from the composition is 5.2246 . It follows that the formation of the alloy is accompanied by a relatively very large increase in volume, 7.07 c.c. of aluminium and 12.07 c.c. of antimony yielding 23.71 c.c. of alloy.

C. H. B.

Hydrated Chromium Chlorides. By ALFRED WERNER and AL. GUBSER (*Ber.*, 1901, 34, 1579—1604. Compare Recoura, *Abstr.*, 1886, 508; Marchetti, 1893, ii, 122; Piccini, 1895, ii, 229; Rohland, 1899, ii, 599).—Four definite hydrates exist: the isomeric green and greyish-blue salts containing $6\text{H}_2\text{O}$, and the compounds $\text{CrCl}_3 \cdot 10\text{H}_2\text{O}$ and $\text{CrCl}_3 \cdot 4\text{H}_2\text{O}$. The greyish-blue hydrate corresponds with the compound $\text{Cr}(\text{NH}_2)_6\text{Cl}_3$; it gives a purple coloured solution, the electrical conductivity of which remains practically constant, and at 25° is 324.5 for μ_{25} . All the chlorine is precipitated by silver nitrate, and its aqueous solution contains four ions, probably $\text{Cr}(\text{OH}_2)_6$ and 3Cl . A freshly prepared solution of the isomeric green salt has a conductivity at 25° and μ_{125} of 126 , but after some 50 minutes this has increased to 236 , and it continues to rise slowly until it reaches practically the same value as that of the greyish-blue salt; corresponding with the change in conductivity, a change in colour is observable. At 0° , the conductivity is 50 for μ_{125} , and changes but slowly. In aqueous solution, it appears to dissociate into two ions, probably $\text{CrCl}_2(\text{OH}_2)_4$ and Cl , as practically only one-third of the total chlorine is precipitated by silver nitrate at 0° . Two of the six mols. of water are less closely combined than the remaining four, and are readily removed when the green hexahydrate is kept in a desiccator; the product formed, $\text{CrCl}_3 \cdot 4\text{H}_2\text{O}$, resembles the original salt in properties, and only one of the three chlorine atoms is precipitated by silver nitrate. The constitution ascribed to the green hexahydrate is $\text{CrCl}_2(\text{OH}_2)_4\text{Cl} \cdot 2\text{H}_2\text{O}$, and corresponds with that of the double salt of Boltwood (*Zeit. anorg. Chem.*, 1895,

10, 181); for example, $\text{CrCl}_2(\text{OH}_2)_4\text{Cl}, 2\text{CsCl}$. Red compounds, $\text{CrCl}_5(\text{OH}_2)\text{Rb}_2$ and $\text{CrCl}_5(\text{OH}_2)\text{Li}_2, 2\text{H}_2\text{O}$, have also been prepared.

J. J. S.

Molybdenum Semipentoxide. By IVAR NORDENSKJÖLD (*Ber.*, 1901, 34, 1572—1577. Compare Klason, this vol., ii, 162).—The following salts have been prepared by methods similar to that employed by Klason.

Potassium molybdanyl chloride, $\text{MoOCl}_3, 2\text{KCl}, 2\text{H}_2\text{O}$, forms dark green, rhombic prisms; the *rubidium* salt, $\text{MoOCl}_3, 2\text{RbCl}$, green, rhombic octahedra; the *caesium* salt, $\text{MoOCl}_3, 2\text{CsCl}$, yellowish-green, rhombic octahedra. Similar compounds have been obtained with the hydrochlorides of methylamine, di- and tri-methylamine, ethylamine, di- and tri-ethylamine, and pyridine.

According to the author, Blomstrand's green oxychloride (*Annalen*, 1880, 201, 126) is a mixture of the pentachloride, MoCl_5 , with the oxychloride, MoO_2Cl_2 , in varying proportions.

J. J. S.

Isomorphism between the Salts of Bismuth and the Rare Earths. By GÖSTE BÖDMAN (*Zeit. anorg. Chem.*, 1901, 27, 254—279. Compare Abstr., 1898, ii, 435).—The ratio of the specific volumes to the specific weights of mixed crystals of the nitrate and sulphate of bismuth, and of didymium, yttrium, and lanthanum, is in accordance with the view that they are isomorphous.

E. C. R.

Formation of Platinum Tetrachloride from Aqueous Hydrochloric Acid by Atmospheric Oxidation in contact with Platinum Black. By JOHN W. MALLETT (*Amer. Chem. J.*, 1901, 25, 430).—Platinum black, prepared by reducing a solution of the tetrachloride with formaldehyde, was washed with water and then left on the filter for several hours; on the addition of hydrochloric acid to the partially dried mass, a considerable quantity of it was dissolved, owing to oxidation of the hydrochloric acid by the occluded oxygen.

E. G.

Mineralogical Chemistry.

[Gold, &c., from Western Australia.] By EDWARD S. SIMPSON (*Ann. Rept. Geol. Survey Western Australia* for 1899, 1900, 48—55).—Several assays are given of native gold from various localities in Western Australia; they vary from Au 76.81, Ag 23.04, copper and iron 0.15 per cent. to Au 99.91, Ag 0.09. The latter, from Boulder, East Coolgardie, is of spongy gold, derived by the oxidation of gold telluride, and is even purer than the gold of Mount Morgan, in Queensland. The occurrence of native tin is noted in the stanniferous gravels at Greenbushes, and further information is given of stibiotantalite (*Trans.*, 1893, 63, 1076) from the same locality. The report also includes several analyses of mineral waters.

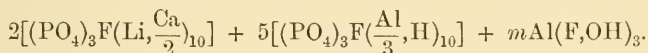
L. J. S.

Composition of Amblygonite. By HENRI LASNE (*Compt. rend.*, 1901, 132, 1191—1194).—The following new analyses are given of amblygonite from Montebbras (Creuse). I, of slightly translucent, faint greyish-pink material. II, of white, opaque material.

	P ₂ O ₅ .	F.	H ₂ O.	Al ₂ O ₃ .	Li ₂ O.	Na ₂ O.	K ₂ O.
I.	46·85	8·51	3·00	34·01	8·50	1·00	0·18
II.	44·62	4·08	7·59	34·32	7·10	2·81	0·23

	CaO.	FeO.	MnO.	Insol.	Total less O for F.
I.	0·23	0·76	0·13	0·55	100·15
II.	0·29	0·46	0·28	0·22	100·28

The formula is deduced as



In I, the value of m is 5, and in II it is 8. [The analyses, however, agree sufficiently closely with Penfield's simple formula, $\text{Li}(\text{AlF})\text{PO}_4$, in which lithium is partly replaced by sodium, &c., and fluorine by hydroxyl.]

L. J. S.

Thomsonite and Mesolite from Golden, Colorado. By HORACE B. PATTON (*Bull. Geol. Soc. Amer.*, 1900, 11, 461—474).—A description, illustrated by seven plates, is given of the several zeolites from the North and South Table Mountains, at Golden, Colorado. Several types of thomsonite are distinguished. The following analyses by R. Chauvenet and R. N. Hartmann are given. I, Freely projecting needles and prisms of thomsonite. II, Material from the centre of a radiating hemispherical mass of thomsonite. III, Fine cotton-like mesolite.

	SiO ₂ .	Al ₂ O ₃ .	CaO.	Na ₂ O.	H ₂ O.	Total.
I.	41·34	30·35	11·20	5·04	12·27	100·20
II.	41·59	30·59	11·15	4·66	12·24	100·23
III.	45·59	25·18	8·93	7·65	12·67	100·02

L. J. S.

Anorthite Crystals from Franklin Furnace, New Jersey. By CHARLES HYDE WARREN (*Amer. J. Sci.*, 1901, [iv], 11, 369—373).—Dull gray, tabular crystals of anorthite occur embedded in a white, crystalline limestone, near the contact of the latter with granite, at Franklin Furnace, New Jersey. A crystallographic description is given; the angle of optical extinction on (001) is -40° . The crystals enclose calcite, scales of graphite, and water. Analysis gave,

SiO ₂ .	Al ₂ O ₃ .	CaO.	Na ₂ O.	CaCO ₃ .	H ₂ O.	Graphite.	Total.
40·16	34·89	18·26	trace	5·30	1·69	0·18	100·48.

Crystallographic descriptions are also given of felspar from Cripple Creek, Colorado, of wolframite from South Dakota, and of pseudomorphs of wolframite after scheelite from Trumbull, Connecticut. The wolframite from South Dakota is of interest in that it contains no manganese.

L. J. S.

Monchiquite from Mount Girnar, India. By JOHN WILLIAM EVANS (*Quart. Journ. Geol. Soc.*, 1901, 57, 38—53).—The monchiquite described is a fine-grained, black rock with numerous white specks, occurring, associated with nepheline-syenite, at Mount Girnar, Junagarh, Kathiawar. Under the microscope, it shows brown hornblende and green augite in a colourless, isotropic ground mass. The latter shows indications of crystalline structure and has a low index of refraction; it gelatinises with acids, and has a sp. gr. of about 2·2; these characters together with the following composition prove this material to be analcite.

SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	CaO.	Na ₂ O(K ₂ O).	H ₂ O.
52·79	21·60	1·96	0·66	14·80	8·19

The occurrence of analcite as a primary constituent of igneous rocks is discussed (compare Abstr., 1898, ii, 170). L. J. S.

Composition of a so-called Blood Rain from Sicily. By FERDINAND JEAN and J. BRUHAT (*Ann. Chim. anal. appl.*, 1901, 6, 161—162).—The dust, which was of a pale ochre colour, was composed of moisture 0·974, organic substances 9·740, sodium and potassium chlorides and sulphates 1·948, iron, calcium and magnesium carbonates 23·051, iron and aluminium oxides 4·543 and silica 59·732; the small quantity of the sample at disposal prevented a more detailed analysis.

A microscopic examination showed very small and differently shaped fragments of silica; amorphous matters soluble with effervescence in dilute hydrochloric acid; vegetable *débris* (woody fibres, vegetable cells, fragments of mycelium, spores of mushrooms, circular spores of *Aspergillus* and oval spores of *Penicillium*); differently shaped fragments of diatoms; finally, small irregular polyhedrons coloured blue by iodine. Inoculated on gelatin, an abundant cultivation of *Aspergillus* was obtained. The authors are of opinion that the dust is not of volcanic origin but resembles that met with in the Sahara.

L. DE K.

Variation in the composition of Natural Mineral Waters detected by the aid of the Electrical Conductivity. By PAUL TH. MULLER (*Compt. rend.*, 1901, 132, 1046—1047).—The determination of the electrical conductivity of the water from a given spring affords a rapid method of ascertaining the secular variation in its composition and may also be applied in ascertaining whether samples of water from neighbouring sources have a common origin. The electrical conductivity of a natural water depends on the nature and amount of the dissolved electrolytes and in potable waters the substances present in solution are almost wholly of this nature.

G. T. M.

Physiological Chemistry.

Respiratory Quotient in Geese. By MAX BLEIBTREU (*Pflüger's Archiv*, 1901, 85, 345—400).—By feeding adult thin geese on food rich in carbohydrate, the respiratory quotient approaches unity. This depends on the increase of carbon dioxide discharged, not on a fall in the amount of oxygen consumed. The formation of fat from carbohydrate in the body must be associated with a splitting off of carbon dioxide.

The milky appearance of the blood-serum in such over-fed animals is due to finely emulsified fat. The origin of this fat is the food, for on starvation, or the giving of food free from fat, it disappears.

W. D. H.

Smallest amount of Oxygen in Water necessary to Fish Life. By JOSEF KÖNIG and B. HÜNNEMEIER (*Zeit. Nahr. Genussm.*, 1901, 4, 385—391).—Physiological experiments with gold-fish, carp, &c., duly recorded in tabular form. The investigation of this problem is beset with many difficulties, and as a rule the mortality among the fish is not merely due to want of oxygen, but to deleterious matters present in the waters.

It appears, however, that carp, which usually thrive in tranquil waters, become unwell if the amount of oxygen by volume is reduced to 0.4—0.1 per 100 c.c.

L. DE K.

Behaviour of Red Blood Corpuscles to certain Reagents. By GEORGE W. STEWART (*J. Physiol.*, 1901, 26, 470—496).—The difference in the behaviour of red blood corpuscles to ammonium chloride and sodium chloride is dependent on the structure of the corpuscle, and principally of the colourless portion of it (stroma, envelope, ghost). The difference is shown by blood which has stood for as much as 12 days without being laked, by blood fixed by formaldehyde, and to a less extent by blood laked by saponin and by water. The resistance to the entrance of ammonium chloride is, however, much greater for fresh than for stale corpuscles. Formaldehyde shortens this period of resistance, and even renders the corpuscles permeable to sodium chloride. Later on, the permeability for ammonium chloride diminishes and that for sodium chloride disappears.

Saponin and water have the same effect on the conductivity of the blood whether they are added to fresh blood, stale blood, blood hardened by formaldehyde, or blood laked by heat. This action does not depend on the liberation of blood pigment. When blood is laked by ammonium chloride or water after the corpuscles have been partially fixed by formaldehyde, the 'ghosts' retain the form of thin discs. Formaldehyde changes hæmoglobin into methæmoglobin.

W. D. H.

Gastric digestion in Elasmobranchs. By ERNST WEINLAND (*Zeit. Biol.*, 1901, 41, 275—294).—The pure gastric juice of the dogfish, torpedo, or ray is a clear, usually acid liquid. The acidity increases by feeding. No hydrochloric acid is present, but the acid is an organic one. The juice of the dogfish is slightly levorotatory. In the secretion, and in the mucous membrane of the dogfish, is a proteolytic enzyme which acts more readily in an acid than in an alkaline medium. In the stomach of the ray is also probably a diastatic ferment which acts only in an alkaline medium; the alternation of acid and alkaline reaction in the gastric juice of this animal is thus useful.

W. D. H.

Effects of the increased consumption of Sugar. By GUSTAV VON BUNGE (*Zeit. Biol.*, 1901, 41, 155—166).—In addition to analyses of honey and fruits which the paper contains, the main point discussed is the influence of sugar as food on metabolism and growth. It is suggested that the anaemia and carious teeth attributed to sugar in the diet of children may be explained by the lessening of iron and calcium if sugar is substituted to any great extent for other articles of a child's food.

W. D. H.

Digestibility of Dextrose. By L. DUCLERT and R. SÉNÉQUIER (*Ann. Agron.*, 1901, 27, 209—220).—Small amounts of dextrose (10—25 grams) were completely absorbed by rabbits; even with 50 grams, none of the sugar passed into the urine or faeces. With 75 grams of dextrose, the gastric mucus and the mucus of the intestine were greatly altered. One hundred grams of dextrose caused the passage of urine and faeces to cease, whilst perforations were found in the stomach; both 75 and 100 grams caused the death of the rabbits.

Further experiments in which rabbits were fed with lucerne and dextrose showed that the presence of the latter did not affect the digestibility of the proteids.

N. H. J. M.

Intestinal absorption of Maltose. By E. WAYMOUTH REID (*J. Physiol.*, 1901, 26, 427—435).—The experiments recorded are similar to those previously described in connection with dextrose. In the normal intestine, the uptake of dextrose and maltose is independent of the relative rates of diffusibility of these substances, although when the epithelium is rendered inactive or removed, these substances leave the gut at the same relative rates as those at which they diffuse through parchment into serum. It is suggested that the ferment which converts maltose into dextrose is produced below the level of the attached ends of the epithelial cells.

W. D. H.

Effect of the withholding of Water on Metabolism. By ALBERT SPIEGLER (*Zeit. Biol.*, 1901, 41, 239—270).—The withholding of water from the diet for short periods produces a lessening of proteid decomposition. This is more marked in men than in dogs, and is explained by a lessening of proteid absorbed from the alimentary canal. In some cases, where apparently there is an increased amount

of digestive fluid secreted, the fall is hardly noticeable. If water is withheld for long periods, there is a rise in proteid katabolism. No evidence of retention in the body of the products of such decomposition was obtained.

W. D. H.

Proteid Katabolism in Inanition. By ERWIN VOIT (*Zeit. Biol.*, 1901, 41, 167—195).—A number of metabolism experiments on various animals in a state of inanition are described and compared with others previously recorded. The amount of proteid decomposition depends on the previous condition of the animals, particularly the amount of fat they contain, the amount of work, and other factors.

W. D. H.

Variations in the composition of the Bile. By R. L. CRACIUNU (*Compt. rend.*, 1901, 132, 1187—1189).—The bile of eighteen animals was analysed. In young animals, the solids are more abundant than in old ones. In thin animals, the solids are more abundant than in fat ones. The amounts of fat and lecithin in the bile increase with age.

W. D. H.

Secretion and composition of Human Bile. By J. BRAND (*Proc. K. Acad. Wetensch. Amsterdam*, 1901, 3, 584—585).—From the examination of the bile in nine cases of cholecystotomy, it is found that the secretion is continuous, sinking in the night, and showing two maxima in the day probably related to the taking of meals. The amount per diem may reach 1100 c.c. The concentration of the bile is fairly constant; the percentage of solids in free flowing bile may reach 1.41, and in that of the gall bladder 20. The amount of pigment (bilirubin, urobilin, and a very small amount of hæmatoporphyrin) is low. The proportion between taurocholate and glycocholate varies between 1.45 and 1.54. A small quantity of sulphur is in combination as ethereal sulphates. The molecular concentration of the bile, whether from the bile duct or gall bladder, is equal to that of blood; but the electrolytic conducting power is greater. It is surmised that mucin influences dissociation or is linked to inorganic compounds.

W. D. H.

Variations in the amount of Thiocyanate in Human Saliva By E. C. SCHNEIDER (*Amer. J. Physiol.*, 1901, 5, 274—280).—The thiocyanate in saliva was estimated in a large number of specimens by the methods of Munk and Solera-Krüger. In smokers, the average percentage of potassium thiocyanate is 0.013; in non-smokers, 0.003. The amount diminishes on prolonged stimulation of the salivary glands. The parotid saliva is always richer than the sub-maxillary saliva of the same person at the same time (compare Grober, this vol., ii, 402).

W. D. H.

Composition of Sweat. By WILLIAM CAMERER, jun. (*Zeit. Biol.*, 1901, 41, 271—274).—The following table gives the analyses of sweat obtained from a healthy adult man:

	Light bath.	Hot air bath.	Steam bath.
Quantity, in grams	60—100	120	300
Specific gravity	1·0084	1·010	1·0055
Reaction	{ once acid once alkaline }		acid alkaline
Water, per cent...	97·9	98·3	99·24
Ethereal extract „ ...	0·17	0·02	0·08
Total nitrogen „ ...	0·15—0·19	0·137	0·09
Urea nitrogen „ ...	0·05	—	0·03
Ammonia nitrogen „ ...	0·012	0·011	0·006
Ash „ ...	0·86—1·04	1·04	0·46
Sodium chloride „ ...	0·66	0·78	0·34
Proteid „ ...	trace	—	trace

W. D. H.

Transport of Fluid by Epithelia. By E. WAYMOUTH REID (*J. Physiol.*, 1901, 26, 436—444).—Experiments are recorded with the ‘surviving’ intestinal mucous membrane of the rabbit, which show that the physiological transport of fluid by the epithelium, as described by Cohnheim, depends on the vitality of the cells; and in warm blooded animals, a low temperature of observation, and deficient oxygenation, rapidly produce death of the active cells. W. D. H.

Rigor Mortis and the Formation of *d*-Lactic Acid. By W. A. OSBORNE (*Proc. Physiol. Soc.*, 1901, xlix—l).—Lactic acid is estimated by preparing the barium salt in solution, heating this with excess of sulphuric acid, and weighing as barium sulphate.

The post mortem formation of lactic acid starts immediately the circulation ceases, and before the onset of rigor. *Rigor mortis* is retarded in mammalian muscle by a previous irrigation through the blood vessels of normal saline solution; the amount of acid formed is also less. If the circulation through a limb is stopped, and the muscles are stimulated either directly or indirectly, the amount of lactic acid formed is approximately equal to that found in the muscles of the opposite limb during *rigor*. If a 0·4 per cent. solution of sarcolactic acid in normal saline solution is led through the hind limbs, the muscles contract spasmodically and pass into *rigor*. The spasms may be arrested and the muscles regain vitality by substituting an alkaline saline solution for the acid one at an early stage of the experiment. Acids other than lactic, however, produce the same result.

W. D. H.

Chemistry and Heat Rigor Curves of Voluntary and Involuntary Vertebrate Muscle. By SWALE VINCENT and THOMAS LEWIS (*J. Physiol.*, 1901, 26, 445—464).—*Rigor mortis* occurs in unstripped muscle, when it is kept some time at the body temperature; slight but definite acidity also occurs. Extracts of unstripped muscle are usually neutral or alkaline, whilst those of striped muscle are usually acid. The characteristic proteid or proteids are probably identical in both cases; the absence of paramyosinogen in fresh extracts of

unstripped muscle is probably due to the reaction. The heat-rigor curves of both kinds of muscle (Brodie's method) show the following contractions, one well marked at 47° — 50° , the next a small contraction at 56° , and a third again well marked at 63° ; the last is attributed to the contraction of connective tissue elements in the muscle. The curves of amphibian muscle show contractions at 38° — 40° , and 45° — 50° in the case of striped, and at 47° and 54° in the case of unstripped, muscle. After muscle has undergone *rigor mortis*, the only contraction is at 63° . Paramyosinogen and myosinogen are possibly formed from a common precursor present in living muscular tissue which coagulates at 47° . The three tissues, unstripped, cardiac, and striped muscle, form a descending series with regard to the amount of nucleo-proteid present; unstripped muscle contains about eight times as much as striped.

W. D. H.

Composition of Elastic Tissue. By G. W. VANDERGRIFT and WILLIAM J. GIES (*Amer. J. Physiol.*, 1901, 5, 287—297).—The *ligamentum nuchæ* of the calf contains 65.1 and of the ox 57.6 per cent. of water. The solids in the ligament from the ox are as follows in percentages:

Inorganic matter 1.1 (SO_3 , 0.062; P_2O_5 , 0.081; Cl, 0.32). Organic matter, 98.1.

Fat	2.64
Albumin and globulin	1.45
Mucin	1.24
Elastin.....	74.64
Gelatin.....	17.04
Extractives, &c.	1.88

W. D. H.

Proteids of the Thymus. By W. HUISKAMP (*Zeit. physiol. Chem.*, 1901, 32, 145—197).—Nucleo-histon is the most abundant proteid in thymus; it comprises 69.4 per cent. of the total proteids; 18.7 per cent. of nucleo-proteid, and 11.9 per cent. of other proteids are present. The characters and composition of nucleo-histon and nucleo-proteid are fully described, together with their compounds with calcium, magnesium, and sodium. Nucleo-histon contains 3.7 and nucleo-proteid 0.9 per cent. of phosphorus. The influence of these proteids on the coagulation of blood plasma was found to be much the same as described by Hammarsten with solutions of fibrinogen.

W. D. H.

Thyreo-globulin. By AD. OSWALD (*Zeit. physiol. Chem.*, 1901, 32, 121—144).—Thyreo-globulin is the main constituent of the colloidal substance of the thyroid vesicles; the nucleo-proteid described by others probably comes, at any rate in part, from the cells. The composition of thyreo-globulin is pretty much the same in various animals, including man. It is the active material of thyroid extract, and contains iodine in combination. The amount of iodine varies considerably, it may even be absent; this is probably largely due to diet.

W. D. H.

Decomposition and Formation of Fat in the Tissues. By C. HESTER (*Virchow's Archiv*, 1901, 164, 293—343).—By local injection

of olive oil into muscles, it is shown that absorption of the fat occurs in the muscular fibres, the fascia cells, and the nerve sheaths. This is hindered by operative interference with the activity of the muscle, such as dividing its tendon. The application of such experiments to fatty degeneration of muscle and in Basedow's disease is pointed out. Further, decomposition of fat occurs in the tissue fluid, and synthesis of fat from the products of decomposition occurs in the muscular fibres. The first action is attributed to the lipase of the blood. W. D. H.

Proteolytic Enzymes in the Organs and Tissues of the Body. By SVEN G. HEDIN and S. ROWLAND (*Proc. Physiol. Soc.*, 1901, xlviii—xlix).—Enzymes were searched for in the expressed juice of certain organs. The amount of nitrogen not precipitable by tannic acid before and after digestion at blood heat in the presence of toluene was estimated. Proteolytic enzymes are present in the juice of lymphatic glands, liver, kidney, and spleen. These have about equal power; the spleen enzyme works best in an acid medium. Weaker enzymes, acting principally in acid solutions, were found in the heart and mammary gland. The enzyme of skeletal muscle is rather weak, and acts equally in acid and alkaline solutions. W. D. H.

[Properties and Composition of Glycogen.] By JOSEPH NERKING (*Pflüger's Archiv*, 1901, 85, 313—319, 320—329).—All the glycogen in muscle cannot be extracted by means of water; the remainder, which in three experiments amounted to 27.5, 33.1, and 16.6 per cent. respectively, can be extracted with dilute alkali.

Analysis of glycogen from the same source gave results which nearly correspond with those required for the empirical formula $C_6H_{10}O_5$.

By inversion with various acids, and for variable periods at the boiling point, it is shown that all the glycogen is not represented in the sugar obtained. The best results were obtained by heating with 2.2 per cent. hydrochloric acid for 3 hours. Here 97 per cent. was converted into sugar. The corresponding number with starch is 95. More prolonged heating leads to a loss of sugar. W. D. H.

Protamine from *Accipenser stellatus*. By D. KURAÉEFF (*Zeit. physiol. Chem.*, 1901, 32, 197—200).—Protamines were prepared from the testis of *Accipenser stellatus*, *Silurus glanis*, and the hake. The former only was obtained in sufficient amount for analysis, the formula of its sulphate being $C_{35}H_{72}O_9N_{18} \cdot 4H_2SO_4$. Examination of its decomposition products (hexon bases) show that the new protamine (*Accipenserine*) belongs to the sturine group. W. D. H.

The Red Colour of Salted Meat. By JOHN S. HALDANE (*J. Hyg.*, 1901, 1, 115—122).—The red colour of cooked salt meat is due to nitric oxide hæmochromogen; this pigment is produced by the decomposition by heat of nitric oxide hæmoglobin. The latter pigment is formed by the action of nitrites on hæmoglobin in the absence of oxygen and presence of reducing agents. The nitrites are formed by reduction within the raw meat from the nitre used in salting. The nitrite is destroyed by prolonged cooking. W. D. H.

Experiments on the Influence of Diet on the separation of Acetone. By SCHUMANN-LECLERQ (*Chem. Centr.*, 1901, i, 1113; from *Wien. klin. Woch.*, 14, 237—242).—Experiments *in persona* confirm the theory that the decomposition of fat in the organism is the main, if not the only, cause of the separation of acetone. The acetone is derived from the fat of the body or of the food in a state either of hunger or of repletion, and whether the diet is of fat or of flesh.

Carbohydrates tend to prevent the formation of acetone by protecting the labile fat before its oxidation.
E. W. W.

Excretion of Antipyrin. By D. LAWROFF (*Zeit. physiol. Chem.*, 1901, 32, 111—120).—Antipyrin is excreted in the urine as a compound of glycuronic acid.
W. D. H.

Chemistry of Nerve Degeneration. By FREDERICK W. MOTT and WILLIAM D. HALLIBURTON (*Proc. Roy. Soc.*, 1901, 68, 149—151. Compare this vol., ii, 260).—A fuller account of researches previously published. the following tabular summary gives the main facts in relation to the experiments on animals :

Days after section.	Cats' sciatic nerves.			Condition of blood.	Condition of nerves.
	Water.	Solids.	Percentage of phosphorus in solids.		
Normal ...	65.1	34.9	1.1	{ Minimal traces of choline present. Choline more abundant.	{ Nerves irritable and histologically healthy. Irritability lost; degeneration beginning.
1—3.....	64.5	35.5	0.9		
4—6.....	69.3	30.7	0.9		
8.....	68.2	31.8	0.5	{ Choline abundant.	{ Degeneration well shown by Marchi reaction.
10.....	70.7	29.3	0.3		
13.....	71.3	28.7	0.2		
25—27.....	72.1	27.9	traces	{ Choline much less.	{ Marchi reaction still seen, but absorption of degenerated fat has set in.
29.....	72.5	27.5	0.0		
44.....	72.6	27.4	0.0	{ Choline almost disappeared.	{ Absorption of fat practically complete. Return of function; nerves regenerated.
100—106...	66.2	33.8	0.9		

W. D. H.

Influence of Caffeine and Theobromine on the excretion of Purine substances in the Urine. By MARTIN KRÜGER and JULIUS SCHMID (*Zeit. physiol. Chem.*, 1901, 32, 104—110).—Caffeine and theobromine do not increase the excretion of uric acid.

The purine bases of the urine are, however, increased; 47 per cent. of the nitrogen of theobromine reappears in the urine as purine nitrogen.

W. D. H.

Inhalation of Ethylene. By J. LORRAIN SMITH and A. PERCY HOSKINS (*J. Hyg.*, 1901, 1, 123—124).—The opinion has been expressed by Roscoe in his evidence before the Water Gas Committee, 1899, that the poisonous action of coal gas and water gas is probably in part due to 'illuminant' hydrocarbons, of which ethylene is the chief, and not to carbon monoxide. Experiments on mice show that the poisonous effects are strictly proportional to the amount of carbon monoxide present. The effects produced by ethylene even when 72 per cent. of it are present are very slight. In air rendered poisonous by the addition of coal gas only about 0.2 per cent. of ethylene would be present, and so any toxic action due to ethylene is absent.

W. D. H.

[Toxicity of Compounds containing both Cyano- and Hydroxyl Groups.] By EDMOND FIQUET (*Bull. Soc. Chim.*, 1901, [iii], 25, 591—598).—See this vol., i, 469.

Behaviour of Cacodylic Acid in the Organism and its detection in Urine. By A. HEFFTER (*Chem. Centr.*, 1901, i, 1109; from *Schweiz. Woch. Pharm.*, 1901, 39, 193—195).—Cacodylic acid is decidedly less poisonous than arsenious acid. In the organism, a portion of the cacodylic acid is oxidised and arsenious or arsenic acid is separated in the urine, whilst the major portion is not attacked and passes into the urine unchanged. Several organs, especially the liver, stomach, and mucous membrane of the intestines, and to a less extent the muscles and kidneys, reduce the acid to cacodylic oxide. This reduction does not depend on the presence of living cells, but is brought about by an easily oxidisable substance, for an aqueous extract of liver has the same effect.

Cacodylic acid is estimated in urine by fusing [the residue left on evaporation?] with one part of potassium hydroxide and 3—4 of potassium nitrate, dissolving in hydrochloric acid, and precipitating the arsenic as sulphide.

E. W. W.

Artificial modifications of Toxins. By JAMES RITCHIE (*J. Hyg.*, 1901, 1, 125—144).—Tetanus toxin under the influence of hydrochloric acid readily loses its virulent properties, but the capacity of producing immunity remains. The less poisonous substances produced are probably toxoids. Sodium hydroxide or carbonate has similar power. Ricin is resistant to the action of hydrochloric acid, but when toxicity is destroyed, the capacity of producing immunity remains. Abrin is also resistant to the acid, but is relatively susceptible to sodium hydroxide; much the same is true for diphtheria toxin, although the power of producing immunity remains as in the other cases.

W. D. H.

Antidotes for chemically pure Proteids. By MANILLE IDE (*Chem. Centr.*, 1901, i, 1109; from *Fortschr. Med.*, 19, 234).—When rabbits are subjected to a prolonged treatment with pure proteids

from cow's milk, administered by injection, the serum is found to contain substances which experiments in glass vessels show to be capable of precipitating these proteids from solution. For the various proteids, such as pseudoglobulin and serum-albumins, different antidotes are formed, the action of each being limited to one proteid and to the same animal species. For every kind of cell there are as many antidotes as there are kinds of proteid contained in it. The agglutinins appear to be the antidotes for the proteids which are readily precipitated whilst the antitoxins correspond with the less easily precipitated substances.

E. W. W.

Chemistry of Vegetable Physiology and Agriculture.

Alcoholic Fermentation without Yeast Cells. X. By EDUARD BUCHNER and RUDOLF RAPP (*Ber.*, 1901, 34, 1523—1530. Compare Abstr., 1900, ii, 606).—Desiccated yeast extract shows practically no falling off of fermentative activity after being kept for 12 months in a stoppered bottle (compare Abstr., 1900, ii, 236). The addition of 1 per cent. of sodium chloride or ammonium chloride to yeast extract only slightly diminishes its activity, but with 2 per cent. the effect is considerable; 1 per cent. of sodium, ammonium, or magnesium sulphate or 1 per cent. of sodium nitrate produces the same effect as 2 per cent. of sodium or magnesium chloride. The presence of 2 per cent. of calcium chloride totally prevents fermentation, although the same amount of barium chloride is almost without influence. Borax has a slightly less effect than common salt.

On adding salts of nitrous acid to fresh yeast extract, a considerable amount of nitrogen is evolved, probably owing to the decomposition of the tyrosine and leucine present (Geret and Hahn, Abstr., 1898, ii, 246).

When 100 grams of sucrose are fermented with yeast extract containing 2 per cent. of arsenious acid (as potassium arsenite), there are produced along with alcohol (50.4 grams) quantities of glycerol (0.5 gram) and succinic acid (0.3 gram) which are much smaller than those obtained by Pasteur in the case of yeast cells; the smallest amounts of glycerol and succinic acid hitherto observed to be formed with yeast cells range from 0.8—1.9 and 0.2—0.3 per cent. respectively of the weight of the sugar taken.

W. A. D.

Yeast Extract. By AUGUSTIN WRÓBLEWSKI (*Bull. Acad. Sci. Cracow*, 1901, 94—95. Compare Abstr., 1900, ii, 157).—The largest and most active portion of the yeast-extract is separated at a low pressure (about 46 kg. per sq. cm.) and is opalescent; further pressure separates a more transparent and less active liquid. The extract contains appreciable quantities of silicic acid, has no marked rotatory power, and can be filtered through a sandstone filter without losing its power of fermenting sugar. The filtrate from a fermenting sugar

solution was found to contain no zymase, but a small quantity of invertin, showing that the former acts only within the yeast-cell, but the latter partly outside it. The hydrolysis of sugar by invertin is a reversible change, and the enzyme has a slight synthetical action on invert-sugar.

T. M. L.

Autofermentation of Yeast. By FR. KUTSCHER (*Zeit. physiol. Chem.*, 1901, 32, 59—78. Compare Salkowski, *ibid.*, 13, 506).—Fresh bottom yeast was thoroughly washed with ice-cold water, and then left in contact with toluene water at a temperature of 38° for some 14 days, when the liquid no longer gave the biuret reaction.

Among the products of fermentation isolated were hypoxanthine bases, leucine and tyrosine, together with ammonia, histidine, arginine, lysine, aspartic acid, and a compound, $C_8H_6O_4N_4$. The same products are formed when the liquid is kept faintly alkaline by the addition of sodium carbonate. Yeast thus contains an enzyme which in its method of fermentation resembles trypsin. Well nourished yeast does not undergo trypsinic fermentation, and no hexon bases have been found in different beers.

J. J. S.

Action of Formaldehyde on Germination. By RICHARD WINDISCH (*Landw. Versuchs-Stat.*, 1901, 55, 241—252. Compare Abstr., 1898, ii, 40).—The experiments previously made with cereal seeds were repeated with a variety of leguminous and some other seeds. Solutions containing 0.02 per cent. of formaldehyde somewhat retarded the germination of linseed, but had no effect on lupins, peas, horse and soy beans; the germinating energy of lucerne and clover was somewhat diminished. The 0.05 per cent. solution greatly retarded the germination of clover and lucerne, and also had some retarding effect on lupins, peas, and beans. As regards the number of seeds which germinated, the 0.05 per cent. solution was found to be very injurious to peas, lucerne, clover, rape and flax, and injured lupins and beans. Solutions containing 0.2 per cent. of formaldehyde killed flax and rape, greatly injured lupins, peas, and clover, and retarded the germination of horse beans; maize was, however, not injured. A 0.4 per cent. solution killed almost all the seeds except maize.

N. H. J. M.

Presence of a Proteolytic Enzyme in Germinated Seeds. By WL. BUTKEWITSCH (*Zeit. physiol. Chem.*, 1901, 32, 1—53. Compare Abstr., 1900, ii, 744, and this vol., ii, 182).—The proteolytic enzyme of germinated *Lupinus* seeds is less active in 0.1 per cent. sodium hydroxide or in 0.2 per cent. hydrochloric acid; in the latter case, most of the products formed can be precipitated by phosphotungstic acid. The activity is increased by the addition of small amounts of hydrocyanic acid.

J. J. S.

A Glucoside characterising the Germinating period of Beech. By P. TAILLEUR (*Compt. rend.*, 1901, 132, 1235—1237).—Beech seedlings contain a glucoside and a diastase which give rise to the production of methyl salicylate and dextrose. The glucoside does not exist in the seed or in old plants, and is produced during germination. It occurs mainly in the hypocotyledonary axes, and is not found in the

cotyledons or in the stems and leaves. (Compare Bourquelot, *J. Pharm.*, 1891; and Abstr., 1896, ii, 540.) N. H. J. M.

Composition of some Conifer Seeds. By ERNST SCHULZE (*Landw. Versuchs-Stat.*, 1901, 55, 267—307. Compare Abstr., 1899, ii, 241 and 242).—The various seeds examined did not differ greatly in composition qualitatively. All of them contained invertible carbohydrates, including sucrose, probably, in every case. Four of the varieties of seeds contained carbohydrates which yielded mucic acid when oxidised. Starch occurred only in the seeds of *Pinus Cembra*. The seeds of *Abies pectinata* contained a volatile oil and a red dye.

The following percentage results were obtained with the various seeds. (1) *Picea excelsa*, (2) *Abies pectinata*, (3) *Larix europæa*, (4) *Pinus silvestris*, (5) *P. maritima*, and (6) *P. Cembra*.

	Proteids.	Ether extract.	Lecithin.	N-free substances.		Starch meal.	Crude fibre.	Ash.	P ₂ O ₅ .
				(1).	(2).				
1.	21·12	32·54	0·20	5·43	35·99	—	25·40	4·74	—
2.	11·90	26·12	0·11	3·36	55·79	—	31·40	2·72	0·66
3.	6·91	10·17	0·11	1·55	79·22	—	51·76	1·99	—
4.	38·19	27·91	0·49	3·56	22·70	—	18·58	7·15	2·34
5.	22·40	22·76	0·43	2·48	47·46	—	36·53	4·47	1·26
6.	7·21	19·16	0·37	7·20	61·64	2·78	38·71	1·64	—

The two columns under nitrogen-free substances refer to the matter soluble in water (1), and that which is insoluble in water, malt-extract, and ether (2). The latter should always be determined in seeds in addition to crude fibre.

The results of analyses of the skins of seeds of *Pinus maritima* and *P. Cembra* are also given. N. H. J. M.

Occurrence of Zinc in the Vegetable Kingdom. By L. LABAND (*Zeit. Nahr.-Genussm.*, 1901, 4, 489—492).—The author has tested some plants grown in the neighbourhood of Scharley, in Upper Silesia, on soil containing zinc and situated close to the zinc mines.

One hundred grams of the well cleansed material dried at 100° were treated according to Halenke's directions with sulphuric acid and a little mercuric oxide; after boiling for about 8 hours, a colourless liquid was obtained. After diluting with water and filtering, the mercury was removed by means of hydrogen sulphide, and in the filtrate the zinc was estimated gravimetrically as zinc oxide, the result being 0·252 gram. In a duplicate experiment, the zinc was deposited by electrolysis, and 0·2018 gram of metallic zinc was obtained.

Reference is made to the work of a large number of investigators who have examined plants grown on soil containing natural or added zinc compounds. L. DE K.

Formation of Asparagine in Plants. By ERNST SCHULZE (*Chem. Centr.*, 1901, i, 1108—1109; from *Landw. Jahrb.*, 30, 287—297. Compare Abstr., 1898, ii, 481; 1900, ii, 612, 745).—The decomposition of proteids in seedlings is due to a hydrolytic action, identical with that brought about by acids or trypsin. The asparagine formed is mainly derived from secondary reactions taking place

between amino-acids and other decomposition products of proteids, but a small quantity may possibly be formed by direct decomposition.

E. W. W.

Beans as Food Material in Servia. By ALEXANDER ZEGA and DOBR. KNEZ-MILOJKOVIĆ (*Chem. Zeit.*, 1901, 25, 396—397).—The authors have analysed a number of different kinds of beans, which are largely made use of by the Servians, both in the raw, green state, and also in the ripe and cooked condition.

J. J. S.

Nori from Japan. By KINTARO OSHIMA and BERNHARD TOLLENS (*Ber.*, 1901, 34, 1422—1424).—Nori is a human food material prepared in Japan from sea algæ (*Porphyra laciniata*) and consists of thin, greenish, paper-like leaves insoluble in water and almost tasteless.

When distilled with hydrochloric acid, nori yields both furfuraldehyde and methylfurfuraldehyde. Oxidation with nitric acid gives mucic acid to the amount of 6.73 per cent. of the weight of nori, besides saccharic acid. The liquid obtained by extracting the substance with dilute hydrochloric acid at 70° gives a beautiful red colour with resorcinol, the presence of fructose or other ketoses being thus indicated.

When hydrolysed with dilute sulphuric acid, nori yields *i*-galactose, *d*-mannose, and probably a small quantity of fucose.

T. H. P.

Manurial Experiments. By JOHN SEBELIEN (*Bied. Centr.*, 1901, 30, 301—305; from *Tidskr. Norsk. Landbr.*, 1901, 8, 69—78).—The results of pot experiments in which oats and peas were grown in peaty soil manured with finely powdered apatite and basic slag respectively, in addition to lime and potassium chloride, accorded with those obtained by Nilson and von Feilitzen, showing that apatite, even finely powdered, has very little effect.

Felspar, as compared with soluble potassium salts, was shown to be of very little use.

Experiments with oats grown in sandy soil, manured with potassium sulphate, calcium carbonate, sodium nitrate, and with various phosphates in addition, gave the following amounts of total produce, taking the produce of a pot which had no phosphates as 100: basic slag (3.9 grams), 931; Peru guano (1, 4.35 and 2, 2.90 grams), 709 and 737; fish guano (3.95 grams), 738; whale guano (6.80 grams), 170; and bone meal (2.10 grams), 706. The varying results which have been at different times obtained with bone meal are attributed to differences in the soil bacteria.

Covering the soil (peat) with sand (15 cm.) considerably increased the yield of peas, but did not give satisfactory results with oats. Application of nitrogen to peas growing in peat-soil greatly increased the produce.

N. H. J. M.

Sugar Beet in Alkali Soil. By H. C. MYERS (*J. Soc. Chem. Ind.*, 1901, 20, 445—448).—The samples of sugar beet examined were grown on the alkali soil of Hooper, Utah, near the Great Salt Lake. Analyses of the soils are also given. The results, showing the percentage of sugar in the beet, and the purity coefficients, indicate that the crop is especially suitable for soils containing amounts of

alkali which prohibit the growth of other crops. The tendency of beet is to improve such land for other crops by taking up the excess of alkali.

As regards the relation between the shape and condition of the roots and the percentage of sugar and the purity, a number of analyses are given of selected roots. It was found that small roots contain the highest percentage of sugar, and that long roots show the highest purity coefficients. Small, slender roots obtained by deep tillage and a limited supply of water are the best.

N. H. J. M.

Fish Meal and its Future in Germany. By FRANZ LEHMANN (*Bied. Centr.*, 1901, 30, 334—337; from *Hannov. Land. Forstwirtsch. Zeit.*, 1900, 193).—Three samples of Norwegian fish guano contained: proteids, 49·7—54·8; fat, 0·93—1·58; ash, 34·24—37·56, and water, 10·4—12·1 per cent. Whale meal was found to contain: proteids, 67·52; fat, 8·10; ash, 2·93, and water, 9·67 per cent. Feeding experiments were made in which cows received 1·5 kilo. of whale meal; this amount had no injurious effect on the taste of the butter.

Herring cake is made by compressing a mixture of crushed grain and herrings; the cake is then dried. The results of feeding experiments by Hennings showed that the taste of butter was not affected at first; subsequently, however, the butter acquired a fishy taste. Herring meal was without influence on milk, cream, and butter.

In some parts of Germany, fish, both raw and cooked, is used for feeding pigs; the meat has an oily taste, and the fat is soft and is yellow or greyish. The effect on the meat of feeding with fish is, however, overcome by feeding for four to six weeks with grain. A more suitable food, a fish meal containing very little fat, is prepared from sticklebacks. Cows received 1 kilo. of the meal without injury to the milk, whilst sheep and pigs had 300 grams per day up to the time they were killed without the quality of the meat being affected. The composition of the meal was as follows: proteids, 62·2; fat, 1·5; water, 11·7; ash, 22·5 (containing $P_2O_5 = 9·5$ per cent.).

N. H. J. M.

Feeding Experiments with Molasses and Peat Meal. By OSCAR KELLNER, O. ZAHN, and H. VON GILLERN (*Landw. Versuchs-Stat.*, 1901, 55, 379—388).—The results of experiments with sheep showed that peat meal is quite indigestible, and that it causes the passage into the fæces of substances which would otherwise be retained or utilised in other ways. The beneficial effect of peat molasses in diminishing colic is due to the molasses and not to the peat.

N. H. J. M.

Feeding Experiments on Cows with Palm Kernel Cake, Crushed Palm Kernels, and Linseed, Ricinus, and Earth Nut Meals. By EBERHARD RAMM, C. MOMSEN, and TH. SCHUMACHER (*Bied. Centr.*, 1901, 30, 321—322; from *Milch-Zeit.*, 1900, Nos. 19, 20, 22 and 23).—Linseed meal gave the highest yield of milk fat; the butter fat had the highest iodine number, which accords with the observation frequently made that linseed meal produces soft butter.

With palm kernel cake, less milk was produced, but nearly as much butter fat, the percentage of fat in the milk being much the highest; the butter was hard, the butter fat not containing much olein. Palm kernels (crushed) were not quite equal to the cake, but form a convenient food.

Earth nut meal is not recommended. Ricinus meal gave the worst results, but it is not injurious.
N. H. J. M.

Cause and importance of Decomposition of Nitrates in Soil. By W. KRÜGER and W. SCHNEIDEWIND (*Bied. Centr.*, 1901, 30, 314—317; from *Landw. Jahrb.*, 1900, 29, 747. Compare Abstr., 1899, ii, 510).—In accordance with previous results, it was found that pentosans from straw caused the greatest destruction of nitrates. Cotton wool caused denitrification, but not to the same extent as crude fibre from straw. Cellulose does not seem to be directly available as food for denitrifying bacteria, but must be first decomposed by other organisms. Peat had no effect, and pentosans extracted from peat only a slight effect. Both sucrose and starch caused considerable reductions in the yield of mustard, this being due to denitrification.

Experiments were made with stable manure which had been kept a year and had lost 41.9 per cent. of dry matter, but no nitrogen, and with similar manure, kept fresh by sterilising, showed that the fresh manure was very injurious, whilst the decomposed manure was decidedly beneficial.

The results of field experiments, in which cow dung, wheat straw, and horse dung were applied, showed in each case diminished yields.

N. H. J. M.

Phosphoric Acid in Soils. By TH. SCHLÖESING, jun. (*Compt. rend.*, 1901, 132, 1189—1191. Compare Abstr., 1899, ii, 119 and 243).—Determinations of phosphoric acid soluble in water were made by agitating the soil (300 grams) with water (1300 c.c.); 1000 c.c. of the solution were then decanted and the same amount of water added to the 300 c.c. remaining with the soil. The process was repeated as long as phosphoric acid continued to be dissolved. Results obtained with three different soils showed that they contained respectively 440, 210, and 130 kilograms of soluble phosphoric acid per hectare.

The results of experiments made by the author (*loc. cit.*) and by Artus (*Ann. Sci. agron. franç. étrang.*, 1901) indicate that the phosphates dissolved in soil water are utilised by plants. Artus's results obtained with light soils showed that the amounts of phosphoric acid soluble in water which they contained corresponded with their wheat producing power.

The extraction of soils with very dilute nitric acid (1—2:10000) (Abstr., 1899, ii, 449) gave results indicating that the phosphoric acid dissolved follows, in the different soils, the amounts dissolved by water. Similar experiments with Hungarian soils have been made by A. de Sigmond (*Ann. Sci. agron. franç. étrang.*, 1900), who considers that 0.075 per cent. of phosphoric acid, soluble in the dilute acid (1000 c.c. of acid to 25 grams of soil), is the limit beyond which an application of phosphatic manures is unnecessary.

N. H. J. M.

Condition of Aluminium in Vegetable Soils. By THÉOPHILE SCHLESING (*Compt. rend.*, 1901, 132, 1203—1212).—The results of experiments with a number of Madagascar soils show that most of them contain either free alumina or aluminium silicates readily attacked by dilute sodium hydroxide solution. The alumina and the silica are chiefly in a sandy condition and do not add to the tenacity of the soils.
N. H. J. M.

Action of the Phosphoric Acid and the Nitrogen in "Leipzig Poudrette" and in "von Krottnaurer's Patent Manure." By O. BÖTTCHER (*Bied. Centr.*, 1901, 30, 310—313; from *Sächs. landw. Zeit.*, 1900, No. 38).—Leipzig poudrette contains N, 4—5; K_2O , 4—5; and P_2O_5 , 4—5 per cent. Von Krottnaurer's patent manure is prepared from slaughterhouse refuse, &c., by treating with sulphuric acid; one kind contains N, 6, and P_2O_5 , 6 per cent.; the other N, 5, and P_2O_5 , 9 per cent. Pot experiments with oats were made in which the manurial effect of the manures was compared with that of double superphosphate and sodium nitrate. The following values were obtained, taking those of the superphosphate and of the nitrate as 100. Effect as phosphatic manure, (1) Leipzig poudrette = 89·8; (2) von Krottnaurer's manure = 94·6. Effect as nitrogenous manure, (1) 43·3; (2) 43·3.
N. H. J. M.

Basic Superphosphate, its preparation and use as a Manure. By JOHN HUGHES (*J. Soc. Chem. Ind.*, 1901, 20, 325—328).—The manure is prepared by mixing superphosphate (85 parts) with slaked lime (15 parts) and allowing the mixture to remain in a heap for 24 hours. Superphosphate, containing soluble phosphate 27·72, and insoluble phosphate 4·82 per cent., treated in this manner, yielded basic superphosphate containing 26·19 per cent. of phosphate soluble in 0·1 per cent. citric acid (1000 c.c. to 1 gram of manure). Of the total substance, 94·7 per cent., containing CaO, 34·66, and P_2O_5 , 12·00 per cent., dissolved in the dilute acid. Cold water dissolved 66·8 per cent., containing CaO, 33·20 per cent., but no phosphoric acid; whilst 2·5 per cent. ammonium citrate solution (100 c.c. to 1 gram of substance) dissolved 86·70 per cent., containing CaO, 32·03, and P_2O_5 , 10·20 per cent.
N. H. J. M.

Analytical Chemistry.

Some Blowpipe Tests. By JOSEPH W. RICHARDS (*J. Amer. Chem. Soc.*, 1901, 23, 213—215).—*Closed Tube Test.*—Water, volatile sulphur, &c., may be estimated with considerable accuracy by heating the substance in a closed tube. The part of the tube containing the sublimate is nicked with a file, broken off, and weighed; the sublimate or condensed water is then driven off by heating, and the tube re-weighed.

Open Tube Test.—The test is uniformly trustworthy if the mineral is finely powdered and finally heated as strongly as possible without melting the glass. When testing the minerals allemontite, dyscrasite and ullmannite, only antimonious oxide is obtained and when the upper part of the tube from which the vapours are escaping is held in the flame, this is coloured pale yellowish-green; in the case of arsenic the coloration is pale blue.

Flame Tests.—When testing for phosphoric acid, the assay on platinum wire is touched when hot with sulphuric acid and brought into the outside edge of the Bunsen flame as low down as possible. The flame will be slightly bluish-green close to the wire, green a short distance away, and yellowish-green farther off. When testing for boron, the wire should be held an inch higher in a hotter part of the flame; when using Turner's mixture, it is best to moisten with sulphuric acid and then place in the edge of the flame.

Reduction to Metal.—In some cases, notably of tin oxide, borax is often preferable to potassium cyanide when reducing with sodium carbonate on charcoal.

Test for Fluorine.—The substance is fused with potassium hydrogen sulphate in a large closed tube of 5 to 8 mm. diameter, heating regularly with the tube almost horizontal. The silica ring deposits just above the assay, and the odour of the gas is often quite perceptible. The tube when cold is broken below the silica ring, and the upper end is held vertically close to the nose when the odour of hydrogen fluoride may be detected with certainty; moreover, the ring will be found to be insoluble in water.

Test for Arsenates.—The substance is mixed with sodium carbonate and charcoal dust, and put into the lower end of an open tube; by playing on it with the reducing flame of the blowpipe directed into the tube, an arsenical coating will be obtained. The test also answers for mercury compounds, antimonates, tellurates, and selenates, whilst ammonium compounds yield ammonia.

Test for Silica in the Sodium Metaphosphate Bead.—It is stated that when testing for silica with microcosmic salt, the silica skeleton is not always left undissolved and sometimes may disappear altogether, as in the case of thaumasite and other minerals; free silica is, however, but very slightly dissolved. As, however, the solution of the silica always takes place slowly and with difficulty and causes a milky opalescence, with a little practice its detection is comparatively easy.

L. DE K.

Estimation of dissolved Oxygen in Waters in presence of Nitrites and of Organic Matter. By SAMUEL RIDEAL and C. G. STEWART (*Analyst*, 1901, 26, 141—147).—The authors use Winkler's manganous chloride process, but, beforehand, oxidise the organic matters and the nitrites. After ascertaining by a preliminary experiment how much $N/10$ permanganate is necessary to communicate a pink colour, lasting for 10 minutes, to the acidified water, they operate as follows: 1 c.c. (or 2 c.c. if more than 10 c.c. of permanganate are used) of sulphuric acid is placed in a Winkler's bottle, the requisite amount of $N/10$ permanganate is introduced, the bottle is filled with

the sample taken straight from the source, closed, and left for ten minutes. The bottle is momentarily opened and 0.5 c.c. of a 2 per cent. solution of potassium oxalate is added to reduce the excess of permanganate.

One c.c. of a 33 per cent. solution of manganous chloride is now passed to the bottom of the bottle from a long pipette, followed by 3 c.c. of a solution containing 50 per cent. of sodium hydroxide and 10 per cent. of potassium iodide. The stopper is inserted and the contents mixed by inversion and rotation. When the liquid has become clear, the stopper is quickly removed, 3 c.c. of hydrochloric acid are introduced, the stopper is re-inserted, and the bottle well rotated for 5 minutes in a dark place. The liberated iodine which represents the free oxygen is then titrated as usual. The correction for the volume occupied by the reagents is small and may usually be neglected. When, however, the amount of oxygen is low, the reagents being presumably saturated with oxygen under atmospheric conditions will make the result too high. The correction then to be applied is : $x = (1000a - Rn)/V - n$, in which x is the number of c.c. of oxygen per litre of the liquid, a the amount of oxygen in c.c. found by titration, V the volume of the bottle, and n that of the reagents, whilst R is the number of c.c. of oxygen contained in a litre of saturated water at the temperature of the experiment which may be actually estimated, or obtained by reference to Roscoe and Lunt's table (Trans., 1889, 55, 532).

L. DE K.

Estimation of Water in Mixtures of Organic Substances and Sodium Hydrogen Carbonates. By JOSEF KÖNIG (*Zeit. Nahr. Genussm.*, 1901, 4, 448—449).—The water is estimated by heating the substance in a glass tube placed in an air-bath at 100—105° while transmitting a current of dry air. The water vapour is absorbed in a weighed calcium chloride tube.

L. DE K.

[**Estimation of Sulphur in Commercial Benzene intended for enriching Illuminating Gas.**] By WILFRID IRWIN (*J. Soc. Chem. Ind.*, 1901, 20, 440—442).—The ordinary Letheby apparatus for the estimation of the total sulphur in coal gas is employed, the gas burner being replaced by a spirit lamp in which are placed 10 c.c. of the benzene and 90 c.c. of alcohol or methylated spirit, and the flame is surrounded with pieces of ammonium sesquicarbonate in the usual manner. The results obtained are considerably higher than those yielded by the method of Holland and Philips (*J. Soc. Chem. Ind.*, 1884, 296).

M. J. S.

Analysis of Strong and Fuming Sulphuric Acid. By H. RABE (*Chem. Zeit.*, 1901, 25, 345—346).—An acid containing exactly 95 per cent. of H_2SO_4 is added from a burette to 25 c.c. of fuming sulphuric acid until fumes are no longer evolved when air is blown through the liquid ; say 24.8 c.c. are required. The experiment is now repeated with the sample to be tested when, say, 30.5 c.c. are required. The percentage of water in the sample will then be found by multiplying 24.8 by 5, and dividing by 30.5.

The amount of free sulphur trioxide in fuming acid may be

estimated by taking 25 c.c. of the sample and adding 95 per cent. acid until fumes are no longer evolved; the experiment is then repeated, using a fuming acid containing a known weight of sulphur trioxide, say, 30 per cent. If the standard acid requires 59.4 c.c., and the sample 49.8 c.c. of 95 per cent. acid, the amount of free sulphur trioxide in the latter will be found by multiplying 49.8 by 30 and dividing by 59.4.

L. DE K.

Standardisation of Thiosulphate Solution. By PERRIN (*Chem. Centr.*, 1901, i, 1115; from *Mon. Sci.*, [iv], 15, i, 244).—Iodine is liberated from a mixture of potassium iodide and iodate by the action of a known quantity of normal sulphuric acid, and is used for standardising the thiosulphate. Both the iodide and thiosulphate employed must be absolutely neutral.

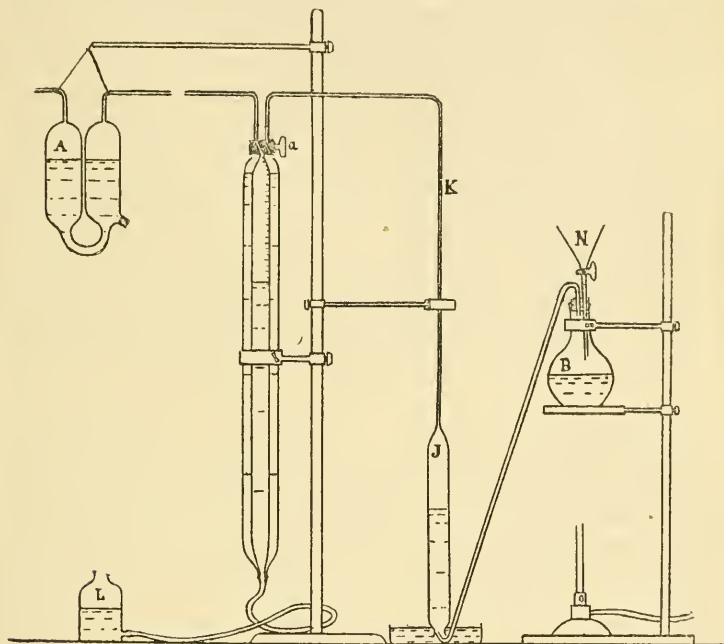
M. J. S.

[Estimations with the] Nitrometer. By C. H. SHEPARD (*J. Amer. Chem. Soc.*, 1901, 23, 267—268).—The author has treated 0.5 gram of potassium nitrate with 32 c.c. of sulphuric acid of varying strength in the nitrometer at 20°. The strongest (98.03 per cent.) acid yielded 222 c.c. of nitric oxide calculated on 1 gram of nitre, whilst the weakest (80.14 per cent.) acid yielded 226.2 c.c. If this difference of 4.02 c.c. (or 2.01 c.c. per 0.5 gram) is due to the difference in solubility of nitric oxide in these two acids, then 32 c.c. of the strong acid absorbs 2.01 c.c. of nitric oxide or 0.0628 c.c. per c.c.; this does not agree with a statement by Lunge (*Abstr.*, 1885, 954) according to which the solubility amounts to only 0.035 c.c. When using the nitrometer, the author prefers an acid of 95 per cent. strength.

L. DE K.

Apparatus for the Estimation of Nitrogen in Nitrates by the Schulze-Tiemann Method. By VL. STANEK (*Zeit. Zuckerind. Böhm.*, 1901, 25, 356—358).—In the estimation of nitrogen by this method, the nitrate is boiled with a hydrochloric acid solution of ferrous chloride, the nitric oxide evolved being collected in a graduated tube over dilute alkali solution; the tube is then transferred to a tall cylinder filled with recently boiled water, and after a time the volume and temperature of the gas are read off. In order to avoid this transference of the measuring tube, the author has devised the apparatus shown in the figure. It consists of a flask, *B*, which is fitted with a tap funnel, *N*, and a gas delivery tube, and contains the ferrous chloride solution and the hydrochloric acid. This mixture is boiled until the flask is completely air-free. While this is going on, the two-way cock, *a*, is so adjusted that the capillary tube, *K*, is connected with the burette, the bottle, *L*, containing water being then manipulated so that the vessel, *J*, and the capillary, *K*, become filled with dilute alkali solution. The cock, *a*, is next turned through 180°, the air expelled from the burette by raising the bottle, *L*, and the cock closed, the apparatus then being ready for use. When *B* is quite air-free, the end of the delivery tube is placed beneath the mouth of *J*, which dips below the surface of a basin containing dilute alkali solution. A measured volume of previously boiled nitrate solution is now introduced into the flask, *B*, by means of the funnel, which is washed with boiled water, the boiling of the liquid being then continued so long as gas bubbles

are evolved. When all the gas has been given off, it is drawn over into the burette, care being taken that the hot liquid does not enter the burette. After a few minutes, the levels of the liquid in the bottle, *L*, and in the burette are equalised, and the volume and temperature of the gas read off. To test the purity of the nitric oxide collected, it is



driven from the burette into the absorption vessel, *A*, containing either saturated ferrous sulphate solution or alkaline potassium permanganate solution; should there be any unabsorbed residue, it is returned to the burette and its volume subtracted from that of the total quantity of gas.

T. H. P.

Estimation of Nitro-groups by a Volumetric Method. By PAUL ALTMANN (*J. pr. Chem.*, 1901, [ii], 63, 370—380).—A weighed quantity of the nitro-compound is added to a known volume of a standard solution of stannous chloride. After warming the mixture for a short time, it is made up to a given volume, of which an aliquot part is taken and added to excess of an alkaline solution of Rochelle salt. The remaining stannous chloride is now titrated with *N*/10 iodine solution, or with potassium permanganate. The details of preparation of the solutions are given in the paper. Standard iodine is inapplicable when much colour is developed, as with mono- or di-nitrophenols, in which case permanganate is used. The method cannot be employed for trinitrophenol or nitronaphthalene.

K. J. P. O.

Rapid Estimation of Phosphoric Acid Soluble in Water in Superphosphates. By LADISLAUS VON SZÉLL (*Landw. Versuchs-Stat.*, 1901, 55, 325—346).—Variations in the results of determinations of soluble phosphoric acid are due to the want of uniformity in the samples of superphosphate; to the extraction being more or less incomplete; to insufficient filtration, and to the use of different methods in determining the phosphoric acid. The following method is proposed.

The sample is rubbed through a 3 mm. sieve and mixed. Twenty grams are then well mixed with water in a mortar, slowly diluted with water, and decanted into a litre shaking-flask. This is repeated four or five times, the residue being finally washed into the flask, which is then nearly filled with water. The flask is then agitated for 15—30 minutes, filled to the mark, and filtered. A portion of the filtrate (50 c.c.) is treated first with sufficient citrate solution (citric acid, 300 grams and 1 litre of 24 per cent. ammonia diluted to 3 litres with water), being stirred all the time, to dissolve the precipitate first produced; and then with one-tenth of this amount of the same solution. Magnesia mixture (25 c.c. is usually sufficient) is then added. After 6—12 hours, it is filtered, washed with 2·5 per cent. ammonia, and dried at 100—120°. The filter containing the precipitate is slowly burnt in a platinum crucible and afterwards heated until white.

N. H. J. M.

Arsenic in Coal and Coke. By R. F. WOOD SMITH and ROBERT LEONARD JENKS (*J. Soc. Chem. Ind.*, 1901, 20, 437).—The contamination of malt with arsenic from the use of an arsenical fuel in the kiln drying is mainly dependent on the proportion of that element which volatilises during the combustion. The following method has therefore been employed to estimate the “volatile” and “fixed” arsenic respectively. A piece of combustion tube about 20 inches long is drawn out at one end to a neck 2—3 mm. in diameter, which is bent at a right angle and passed through the rubber stopper of a wash-bottle containing dilute sulphuric acid. About an inch from this neck the tube is constricted at a second place so as to leave a bulb, and then 6—8 inches of the tube are filled with the fuel in fragments about the size of a pea. The fuel is burnt by heating the tube whilst aspirating air in the direction of the wash-bottle, care being taken that the products of combustion do not pass over the ash. The tube is then severed at the constriction, the bulb is washed into the acid, and the volatile arsenic estimated by the Marsh apparatus. The ash of the fuel may also be dissolved in dilute sulphuric acid for the estimation of the fixed arsenic. The numbers so obtained agreed well with those of practical work.

M. J. S.

Determination of Minute Quantities of Arsenic in Coke. By LEONARD ARCHBUTT and PERCY GEORGE JACKSON (*J. Soc. Chem. Ind.*, 1901, 20, 448—450).—The powdered coke (50 grams) is gently boiled for 2 hours with 100 c.c. of nitric acid of sp. gr. 1·42 in a retort with the neck inclined upwards, which answers the purpose of a reflux condenser. The solution is diluted, filtered, and repeatedly evaporated, after adding sulphuric acid, until every trace of nitric acid is expelled. It is then distilled with addition of 23 grams of pure

sodium chloride and 2 grams of ferrous sulphate, the total volume not exceeding 100. c.c. When the temperature reaches 125°, all the arsenic will have distilled over. It is collected in about 20 c.c. of water, and precipitated by adding zinc sulphide to the acid distillate. The precipitate is collected, washed, and then dissolved by boiling it with 300 c.c. of water for half an hour. The solution is concentrated to 40 c.c., mixed with sodium hydrogen carbonate and starch, and titrated with *N*/100 iodine. Blank experiments with the reagents used are necessary, and the iodine solution must be standardised with arsenious sulphide dissolved in the same manner.

M. J. S.

Special Crucible for Carbon Combustions. By PORTER W. SHIMER (*J. Amer. Chem. Soc.*, 1901, 23, 227—228).—The author has modified his arrangement for the combustion of free carbon in a platinum crucible (Abstr., 1899, ii, 694), and instead of cooling the upper part by means of a wet wick the crucible is now fitted with an annular platinum cooling chamber about 1/2 inch wide and 1/8 inch deep, having short platinum inlet and outlet tubes at opposite sides. The water after flowing through the stopper is conducted to the cooling chamber of the crucible by bent glass and rubber tubing, through which it flows to waste.

The rubber band by which the crucible is tightly closed is effectually cooled on its inner side by contact with the cold stopper, and on its outer side by contact with the cold top of the crucible. Two drawings are given showing the exact position of the tubes for the inlet and outlet of the air or oxygen. If the apparatus is used for determining combined water in minerals, cements, &c., the circulating water should be heated to prevent condensation of water-vapour on the stopper.

L. DE K.

A Rapid Method of Estimating Carbon Dioxide in Air. By JOHN S. HALDANE (*J. Hyg.*, 1901, 1, 109—114).—A portable piece of apparatus is described and figured by means of which the amount of carbon dioxide in air can be determined by absorption in potassium hydroxide, within five minutes, and without any calculations.

W. D. H.

Estimation of Calcium, Magnesium, and Phosphoric Acid in the Presence of a notable proportion of Iron Oxide. By HENRI PELLET (*Ann. Chim. anal. appl.*, 1901, 6, 163—165).—The author states that when estimating calcium in acetic acid solution by means of ammonium oxalate without removing any large excess of iron which it may contain, it is necessary to add 15 or 20 times more of the reagent than is required in the absence of iron. To estimate magnesium in the presence of calcium and much iron, a much larger excess of ammonium citrate than usual should be added, followed by a large excess of sodium phosphate and ammonia. For the estimation of phosphoric acid, the liquid is mixed with about 20 drops of solution of ammonium citrate to prevent precipitation of free molybdic acid and then treated as usual with molybdate solution. The yellow precipitate is purified by dissolving it in ammonia and reprecipitating

with dilute nitric acid; it then, after drying at 100° , contains exactly 3.75 per cent. of phosphoric oxide. L. DE K.

Estimation of Metals by Organic Bases. By W. HERZ (*Zeit. anorg. Chem.*, 1901, 27, 310—311).—The method previously described by the author (this vol., ii, 240, 348) gives accurate results with the following metals. Copper is completely precipitated by guanidine, and a cold solution of piperidine precipitates salts of copper, magnesium, and zinc.

Tetramethylammonium hydroxide also gives quantitative precipitates with metallic salts, but this precipitate is so gelatinous that it is exceedingly difficult to wash. E. C. R.

Electrolytic Separation of Lead from Manganese. By IVAR MOLTKE-HANSEN (*Chem. Zeit.*, 1901, 25, 393—395).—Lead may be precipitated by electrolysis as dioxide free from manganese by operating as follows. If the solution which should contain about 0.2 gram of lead in 150 c.c. contains also an amount of manganese not exceeding 0.03 gram, the liquid should contain 25—27 c.c. of nitric acid of sp. gr. 1.42 or 55—60 c.c. of acid of sp. gr. 1.19, and should be electrolysed at 70° with a current of 2 amperes. The lead is completely precipitated in 35—40 minutes.

If the amount of manganese reaches 0.04 gram, fairly accurate results may still be obtained by adding 35 c.c. of nitric acid of sp. gr. 1.42 and using a current of $2\frac{1}{2}$ amperes, or, better still, by adding the same amount of nitric acid as before, and afterwards a little oxalic acid to redissolve any precipitate of manganese dioxide; a few more c.c. of nitric acid may then also be added. L. DE K.

Cyanogen Compounds of Silver and Copper in Gravimetric Analysis. By OTTO BRUNCK (*Ber.*, 1901, 34, 1604—1609).—Cold dilute nitric acid has no action on even freshly precipitated silver cyanide, but on warming with 1 per cent. acid for an hour, 5 per cent. of the salt dissolves, and only part is reprecipitated on cooling. The amount dissolved is somewhat less if an excess of hydrocyanic acid is present. Treatment with warm dilute nitric acid is not an accurate method for the separation of silver and copper cyanides, as an acid sufficiently strong (5 per cent.) to dissolve the copper cyanide has an appreciable solvent action on the silver compound. In the absence of copper, however, the method may be employed for the estimation of silver provided the acid is sufficiently dilute and the precipitation is carried out below 50° .

Silver and copper may be separated electrolytically provided sufficient potassium cyanide is present to render the ionisation of the complex copper salt practically *nil*. With 2 grams of potassium cyanide in 100 c.c. of liquid, a current of 4 volts and 0.5 ampere may be employed. If paracyanogen separates during the electrolysis, it is advisable to add a little potassium hydroxide. The current must be maintained while the deposit is being washed. J. J. S.

Analysis of Commercial Copper. By AUGUSTE HOLLARD (*Ann. Chim. anal. appl.*, 1901, 6, 162—163. Compare Abstr., 1900, ii, 442).—Truchot having stated that the author does not include manganese among

the impurities of commercial copper, although it is found in notable quantities in Boleo and Arizona copper, the author has tested two samples of supposed manganiferous copper from Boleo, sent at his request by Truchot. After carefully removing any accompanying dross, which no doubt was very rich in manganese, the metal was carefully tested and found to be perfectly free from that impurity.

L. DE K.

Action of Potassium and Sodium Hydroxides on Stannous Sulphide. By F. MOLLWO PERKIN (*J. Soc. Chem. Ind.*, 1901, 20, 425—426).—The behaviour of precipitated stannous sulphide with solutions of the alkali hydroxides is not uniform. Even when the conditions of precipitation are seemingly identical, the precipitate sometimes dissolves, but more often does not. In cases where solution took place, a subsequent precipitation of metallic tin frequently occurred. The alkali hydroxides should therefore never be employed for the separation of the sulphides of the arsenic group from those of the copper group when the presence of stannous sulphide is possible. Stannic sulphide, and the sulphides of arsenic and antimony dissolve readily, but are incompletely precipitated on acidifying, unless hydrogen sulphide is added.

M. J. S.

Iodometric Estimation of Antimonic Acid and the Volumetric Estimation of Antimony in presence of Tin. By MARTIN ROHMER (*Ber.*, 1901, 34, 1565—1568).—Antimonic acid, like arsenic acid, is rapidly reduced by sulphur dioxide in presence of hydrochloric acid and traces of hydrobromic acid (this vol., ii, 194), and can be estimated, after boiling to remove sulphur dioxide, by adding tartaric acid, neutralising with sodium nitrogen carbonate, adding an excess of about 1 c.c. of an *N*/20 solution of iodine, and titrating back with sodium thiosulphate, using starch as an indicator; this method gives far better results than that of Mohr.

In presence of tin, the oxidation by iodine of antimony trioxide to antimonic acid is greatly retarded, but this difficulty can be obviated by using large quantities (10—20 grams) of tartaric acid. The mixed sulphides of tin and antimony are dissolved in concentrated hydrochloric acid containing potassium chlorate in an inclined flask of 300—500 c.c. capacity; after boiling to remove chlorine, 1 gram of potassium bromide is added, the solution boiled with aqueous sulphur dioxide, and then titrated with iodine as just described. When arsenic is present, it is removed in the beginning by distillation (*loc. cit.*).

W. A. D.

Estimation of Dry Matter in Soils. By H. PUCHNER (*Landw. Versuchs-Stat.*, 1901, 55, 309—324. Compare *Abstr.*, 1895, ii, 544).—A reply to Tryller (*Abstr.*, 1897, ii, 523). After drying the sample at 105° in a Soxhlet or Ulsch drying apparatus, the vessels containing the dry soil should be closed before being put into a desiccator to cool, and only opened for a moment before weighing. The substance should be well ventilated during drying, so as to avoid any accumulation of gases from the burner. The drying oven is to be heated to 105° before putting the substance in, and the temperature should be kept as uniform as possible.

N. H. J. M.

Chemico-toxicological Detection of Bromoform and Bromal. By DIOSCORIDE VITALI (*Chem. Centr.*, 1901, i, 1067; from *Boll. Chim. Farm.*, 40, 173—178).—Hydrogen which has been passed through a liquid containing bromoform, and is then ignited on the surface of brass wire gauze, burns with a characteristic blue flame. If the products of combustion are passed through ammonia, the ammonia becomes blue, and bromine can be detected in it by silver nitrate, or by evaporating and examining with the microscope for crystals of ammonium bromide. If the hydrogen containing bromoform vapour is passed over solid potassium hydroxide moistened with thymol, the latter becomes violet; if passed through alcoholic potash to which a little aniline has been added, the characteristic odour of phenylcarbamine is developed. Or the hydrogen may be passed through alcoholic potash and the liquid be boiled and evaporated to dryness; on adding concentrated sulphuric acid and cupric sulphate, blackish-violet cupric bromide is produced. Or the residue may be neutralised with acetic acid, treated with uric acid and some potassium bromate, and evaporated to dryness; then, on adding ammonia, the murexide reaction is obtained. For quantitative estimation, the liquid may be cohobated with alcoholic potash, and the resulting potassium bromide determined.
M. J. S.

Detection of Methyl Alcohol in Vinegar. By R. ROBINE (*Ann. Chim. anal. appl.*, 1901, 6, 171—174; continued from this vol., ii, 353).—In order to get trustworthy results, the dimethylaniline should be tested as to its purity. One c.c. is heated in a corked flask with 50 c.c. of water and 2—3 drops of acetic acid for $2\frac{1}{2}$ hours at 70—80°, the excess of dimethylaniline is then boiled off, and the colour test is applied; if this gives a negative result, the product may be used, but otherwise it should be purified by fractional distillation. It is also very important to expel all traces of acetaldehyde, although if the distillation is carried further than necessary there is great risk of losing methyl compounds. The sodium hydroxide should not be added in a too large excess and the excess of dimethylaniline should be completely boiled off. The purity of the lead dioxide used in the final colour reaction is also of great importance; it should be well washed with water to remove possible traces of alkali hypochlorites. In applying the dioxide, it should be added in small portions to the boiling liquid as a large excess destroys the blue colour. With these precautions, it is possible to demonstrate the presence of 0.1 per cent. of methyl alcohol.
L. DE K.

Estimation of Soluble Nitrocellulose in Gun-cotton and Smokeless Powder. By K. B. QUINAN (*J. Amer. Chem. Soc.*, 1901, 23, 258—264).—The proportion of soluble matter is best estimated by determining the amount of insoluble matter as follows.

One gram of the finely divided dry sample of gun-cotton or smokeless powder is introduced into an aluminium vessel and well stirred with 50 c.c. of alcohol, 100 c.c. of ether are then added and the whole again well stirred for several minutes. After removing the rod, the vessel is placed in one of the cups of a centrifugal machine and covered with a loosely fitting aluminium cap. In the second cup is placed

another aluminium vessel similarly filled. The machine is now started gradually and then run at full speed for 10—12 minutes. This causes the insoluble matters to collect at the bottom of the vessel, and the supernatant liquid may then be drawn off with a vacuum pipette. The residue is now freed from soluble matter by repeatedly whirling with successive quantities of ether-alcohol mixture, and then transferred to a Gooch crucible provided with the usual pad of asbestos; it is then dried at 100° and weighed.

In some cases, acetone may be substituted for ether-alcohol.

L. DE K.

Some Analyses of Pure Oatmeal. By BERNARD DYER (*Analyst*, 1901, 26, 153—154).—A table is given showing the result of the analysis of 13 samples of fine oatmeal, 6 samples of coarse oatmeal, and 8 samples of crushed or flattened oats. The figures given are those relating to moisture, oil, nitrogen, proteids ($N \times 6.25$), total ash and portion soluble in hydrochloric acid, the indigestible fibre and starch, with other digestible carbohydrates, being estimated by difference.

It appears that the proteids vary from 13 to 18, and the oil or fat from 7 to 12 per cent. In the two cases where the proteids reached 18 per cent., the proportions of both ash and indigestible fibre are also very large, as though the proportion of farinaceous substances to integument was smaller in these cases.

L. DE K.

Complete Analysis of Feeding Materials. By C. A. BROWNE, jun., and C. P. BEISTLE (*J. Amer. Chem. Soc.*, 1901, 23, 229—236).—The dried fodder is treated in succession with ether, boiling alcohol, cold water, solution of diastase, dilute sulphuric acid (1.25 per cent.), and dilute sodium hydroxide (1.25 per cent.), and the various dissolved and undissolved matters are estimated in the usual manner. The matter insoluble in sodium hydroxide is chlorinated for one hour and then again treated with alkali to remove condensed lignin. Pentosans are estimated in the original substance, and also in the residue from the chlorination process.

The authors have shown, by a series of experiments, that the pentosans pass to a large extent into the aqueous extract, and as they possess a decided cupric reducing power, it follows that they must greatly affect the accuracy of the estimation of dextrin. Another small quantity of pentosan is dissolved by the diastase treatment and slightly affects the accuracy of the estimation of starch. A large proportion of the pentosans is removed by the acid treatment. The furfuraldehyde-yielding constituents of the chlorinated fibre may perhaps not consist of true pentosans, but have an oxycellulose nature.

L. DE K.

Analysis of Soap. By PAUL BOHRISH (*Chem. Zeit.*, 1901, 25, 395—396).—After criticising various methods, the author recommends the following process. Moisture is estimated by drying 5 grams of soap shavings in an air-bath at 105°, the soap being first mixed with sand and a little alcohol, and the latter removed by heating on a water-bath. Ash is estimated by burning 5 grams of the sample and the sodium chloride contained therein is estimated by Volhard's silver process. The fatty

acids are estimated by heating 5 grams of the sample with 200 c.c. of water and 50 c.c. of $N/2$ sulphuric acid, the acids are collected on a weighed filter, well washed with hot water, and dried in a dish at 102° . They contain, however, the insoluble matters (fillings) and these are found by incineration. The filtrate is diluted to 500 c.c., and 100 c.c. are titrated with $N/10$ potassium hydroxide; the total alkali is thus obtained. To estimate free alkali, 5 grams of a soda soap or 30 grams of an olein soap are dissolved in hot absolute alcohol, the residue is well washed with the alcohol, and the filtrate is titrated with $N/2$ sulphuric acid. The residue is then dissolved in hot water, mixed with 50 c.c. of $N/2$ sulphuric acid, boiled, and the excess of acid titrated with $N/2$ potassium hydroxide; this gives the alkali carbonate.

L. DE K.

Apparatus for the simultaneous Estimation of Fat and Water in Butter. By HEINRICH PODA (*Zeit. Nahr. Genussm.*, 1901, 4, 492—496).—Eight c.c. of sulphuric acid of sp. gr. 1.64 are introduced into a specially constructed graduated tube, which is then placed for 5 minutes in a beaker containing boiling water, when the volume of acid is again carefully read. By means of a butter sampler, some of the butter to be tested is introduced into the tube; this is then stoppered, well shaken, and replaced in the beaker for 3 minutes. The tube is then whirled for 2 minutes in the Gerber apparatus. If no proper separation has taken place, the tube must be again shaken, replaced for 3 minutes in the boiling water, and again whirled. When a clear separation has taken place, the tube is finally placed for 4 minutes in the boiling water, and the volume of the two layers read off. The top layer is the butter, *minus* water and non-fatty substances; the bottom layer consists of the original sulphuric acid, *plus* the water and non-fatty matters of the butter. If the volume of the fatty layer be called f , and the increase of the acid w , then the percentage by weight of water, &c., in the sample will be found by dividing 100 by $1 + 0.848.f/w$. The percentage of fat is then found by deducting the result from 100. The results agree well with those found by gravimetric analysis.

L. DE K.

Butter control and the Reichert-Meissl Figure. By MORITZ SIEGFELD (*Zeit. Nahr. Genussm.*, 1901, 4, 433—446).—A lengthy record of authenticated cases of genuine butters where the Reichert-Meissl number fell below the recognised standard.

L. DE K.

Causes of the varying Composition of Butter. By J. J. L. VAN RYN (*Landw. Versuchs-Stat.*, 1901, 55, 347—378).—Physical and chemical constants were determined in a large number of samples of butter obtained during different months. It was found that feeding in stalls as compared with pasture had a considerable effect on the composition of the butter. Whilst in Limburg and North Brabant no samples of butter showed abnormal values (never lower than 28) for the saturation numbers of the volatile fatty acids at the end of October and the beginning of November, samples from more northern parts of Holland, where the cows are kept on pasture until late in the autumn, only rarely gave numbers as high as 28.

Chemical and physical examinations of butter are insufficient to show whether the sample is pure, unless the results greatly exceed the limits usually adopted, or unless the presence of margarine can be qualitatively established.

N. H. J. M.

Baudouin's Reaction for the detection of Sesamé Oil, and Tambon's Modification of the Test. By F. URZ (*Chem. Zeit.*, 1901, 25, 412—413. Compare Abstr., 1900, ii, 699).—A review of the many modifications of Baudouin's hydrochloric acid and sugar test for sesamé oil proposed from time to time.

The author cannot recommend the latest modification proposed by Tambon (this vol., ii, 360). Soltsien's reaction with stannous chloride (Abstr., 1900, ii, 325) seems to give the most trustworthy results.

L. DE K.

Sunflower Oil. By FERDINAND JEAN (*Ann. Chim. anal. appl.*, 1901, 6, 166—167).—This oil, according to the author, is palatable, well adapted for burning in lamps, and also has considerable drying properties; for soap making, it is not so well adapted.

The following properties are given, sp. gr. 0.925, refraction in oleorefractometer + 22°, saponification number 192, iodine absorption 124, critical temperature of solution in 94 per cent. alcohol 104°, melting point of fatty acids 22°, unsaponifiable matter (phytosterol) 0.72 per cent., acidity as oleic acid 3.102, solubility in alcohol 0.6 per cent. With a drop of sulphuric acid, a persisting golden-yellow spot is obtained, surrounded by a greyish-blue zone, fringed with clear, brownish spots; this is a very characteristic test for the oil. The oil reduces an alcoholic solution of silver nitrate, but is not affected by Halphen's sulphur reagent or by a mixture of sugar and hydrochloric acid.

L. DE K.

Approximate Estimation of Formaldehyde in Milk. By JOHN F. LIVERSEEGE (*Analyst*, 1901, 26, 151—152).—The reagent consists of a mixture of 100 c.c. of sulphuric acid and 2.5 c.c. of normal ferric chloride, which, as is well known, causes the formation of a violet-blue ring when added to milk containing formaldehyde. Ten c.c. of the suspected sample are put into a 25 c.c. stoppered cylinder, and the reagent is added 1 c.c. at a time, until a violet colour appears and does not increase in intensity. By making experiments side by side with samples containing a definite proportion of formaldehyde, a fair idea as to the percentage may be obtained as the violet-colour appears the sooner the more formaldehyde is present.

L. DE K.

Detection and Estimation of Preservatives in Milk. By MEREDITH WYNTER BLYTH (*Analyst*, 1901, 26, 148—150).—Ten c.c. of the suspected samples are put into clean, wide test-tubes, and into another tube are put 10 c.c. of a sterilised milk free from preservatives. To each milk are added 2 c.c. of a very strong, slightly alkaline solution of litmus, and if any of them should show an acid reaction, this is remedied by cautiously adding $N/2$ sodium hydroxide. After plugging the tubes with cotton-wool they are heated for 10 minutes in a water-bath at 80°, and when cold are each inoculated with 0.5 c.c. of a

mixture of 0.5 c.c. of sour milk and 100 c.c. of water. After thoroughly shaking, the tubes are kept for 24 hours at any temperature between 15° and 25° and then examined. Those tubes which contain preservatives will remain blue or pink, whilst those containing no preservatives will behave in the same way as the pure sample and become white, or nearly so. The length of time the colour takes to fade depends on the nature and quantity of the preservative added. 0.005 per cent. of borax, boric acid, or mixtures of these substances, 0.05 per cent. of salicylic acid, and 0.0003 per cent. of formaldehyde may be detected by this process; their exact nature must, of course, be determined by the ordinary methods.

As regards the determination of the amount of the preservative, this, in the case of borates or salicylic acid, is best effected by the usual chemical methods, but for formaldehyde the bacteriological process is best adapted. Into each of two test-tubes is introduced 10 c.c. of the sample (solutions A). Another 10 c.c. is diluted to 100 c.c. with milk free from preservatives, and 10 c.c. of the mixture is put into each of another two test-tubes (solutions B). Ten c.c. of solution B are diluted to 100 c.c. with milk free from preservatives, and 10 c.c. of this is put into two tubes (solutions C). Three control tubes are prepared of 10 c.c., each containing 0.005, 0.003 and 0.001 per cent. of formaldehyde respectively (control A). Four control tubes are prepared of 10 c.c., each containing 0.001, 0.0008, 0.0005, and 0.0003 per cent. of formaldehyde respectively (control B). All the tubes are coloured with litmus, heated to 80°, allowed to cool, and inoculated in the manner described. One tube of A, one of B, one of C, and the three control solutions A are placed in the warm incubator at 22° for 24 hours, and all the other tubes are placed in the cold incubator for 24 hours. From a comparison of the colours, a very close approximation may then be made to the quantity of formaldehyde originally present in the milk, providing that quantity does not exceed 0.5 per cent., in which case still larger dilutions should be made.

L. DE K.

Spectral Reactions of Methylfurfuraldehyde. By KINTARO OSHIMA and BERNHARD TOLLENS (*Ber.*, 1901, 34, 1425—1426).—Widtsoe and Tollens (*Abstr.*, 1900, i, 244) have shown that the presence of methylpentoses or methylpentosans in a substance may be detected by distilling with hydrochloric acid of sp. gr. 1.06, mixing the distillate with an equal volume of concentrated hydrochloric acid, and examining the absorption spectrum of the liquid. If methylfurfuraldehyde is present, dark bands are seen between the green and blue, the violet also being darkened although remaining distinctly visible. It is now found that this reaction becomes more sensitive in presence of phloroglucinol, and that the test is conveniently carried out as follows. About 5 c.c. of the hydrochloric acid distillate are mixed in a test-tube with an equal volume of concentrated hydrochloric acid, and a solution of phloroglucinol in hydrochloric acid of sp. gr. 1.06; after about 5 minutes, the liquid is filtered to remove any furfuraldehyde phloroglucide and examined spectroscopically.

T. H. P.

Detection of Acetanilide in Urine. By A. PETERMANN (*Ann. Chim. anal. appl.*, 1901, 6, 165. Compare this vol., ii, 293).—Ten c.c. of cows' urine are mixed with 25 c.c. of strong hydrochloric acid and boiled for a few minutes. When cold, 1 c.c. of a 3 per cent. aqueous solution of phenol is added and then, after shaking, 2 or 3 drops of a 10 per cent. solution of bleaching powder, shaking after the addition of each drop; as much as six drops may be added if no reaction is at first obtained. In the presence of *p*-aminophenol, a product of decomposition of acetanilide, the urine assumes a red colour, but as this may be simply due to the action of the acid on the urine itself, the liquid is made alkaline with ammonia, which should turn the colour to blue. In the presence of much acetanilide the reaction is safe, but otherwise somewhat doubtful; a further confirmatory test should therefore be made. 100—200 c.c. of the suspected urine are mixed with 25—50 c.c. of hydrochloric acid and boiled for some minutes. When cold, the liquid is neutralised with calcium carbonate and extracted several times with ether. The ether is then shaken with dilute hydrochloric acid (1:3), the acid liquid is warmed to expel any ether, and then treated as directed with phenol, bleaching powder, and ammonia. The reaction will then be very distinct.

L. DE K.

Microchemical Investigation of Alkaloids. By M. E. Pozzi-ESCOT (*Compt. rend.*, 1901, 132, 1062).—When viewed under the microscope, strychnine platinichloride presents the appearance of starlike aggregates of pink, flattened prisms, its aurichloride forms aggregated prisms, and the compound produced with potassium iodide separates in well-defined sheaves of olive-green crystals.

Brucine platinichloride forms acicular prisms.

Quinine platinichloride separates in small, anisotropic granules, whilst its potassium periodide forms microscopic prisms.

Cocaine platinichloride forms serrated crystals consisting of aggregates of prismatic needles; its aurichloride separates in serrated crystals grouped in arborescent clusters.

Codaine, when treated with mercuric iodide dissolved in potassium iodide, yields rosettes of almost black crystals.

Atropine when treated with iodine dissolved in potassium iodide, yields an abundant crop of black, acicular crystals exhibiting external twinning; morphine under these conditions furnishes crystals separating in clusters resembling thistle flowers.

G. T. M.

Evaluation of Medicinal Drugs containing Alkaloids. By HARRY M. GORDIN (*Arch. Pharm.*, 1901, 239, 214—231).—The amount of alkaloid present in various drugs was determined by the author's method (*Abstr.*, 1900, ii, 119, 777), the alkaloid being extracted thoroughly with a suitable solvent, and the residue examined further to ensure that the extraction was complete. This method is too tedious for ordinary use, however; the results given by it were used as a standard with which those obtained by more expeditious methods were compared and judged. Of these methods, two were employed: (A), 10—20 grams of the powdered drug were extracted for 2—4 hours with boiling 95 per cent. alcohol in Dunstan and Short's apparatus (*Pharm. J.*, [iii], 13, 664). The alcoholic extract

was concentrated by distillation on the water-bath to about 10 c.c., cooled, and diluted to 50 or 100 c.c. with water slightly acidified, shaken well with about 1 gram of pure, powdered talc, and filtered. An aliquot portion of the filtrate was made alkaline with a suitable alkali, and the alkaloid extracted by shaking three or four times in succession with a suitable mixture of ether or chloroform. If ammonia had been used, the solvent was simply distilled off; if a fixed alkali, it was first shaken with a little calcined magnesia, filtered through a dry filter, and then distilled. The residue was dissolved in an excess of standard acid, and the alkaloid estimated by the author's method. The method A is rapid and easy, and it is cheap because all the solvents are recovered. (B) 10—20 grams of the drug, very finely powdered, were digested for 6—12 hours with frequent shaking with 10—15 times their weight of modified Prollius' liquid (28 per cent. ammonia, 10 c.c.; alcohol, 25 c.c.; chloroform, 80 c.c.; ether, 250 c.c.). When the liquid had cleared, an aliquot part was removed with a pipette; this was either shaken with water slightly acidified, or the solvent was distilled off from it, and the residue dissolved in dilute acid. The aqueous solution was then made alkaline, extracted with ether-chloroform, &c., as in the other method. This method is very like Keller's, but avoids the use of water, which introduces uncertainty into the results. With coca leaves and *Hydrastis canadensis*, method A should be used; it gives results identical with those obtained by the standard method. With cinchona bark, method B gives correct results, both for total alkaloids and those soluble in ether; it should also be used with *Nux vomica*, although the results are slightly low in this case; and with ipecacuanha, for although the results are low when the factor used is calculated from the formula $C_{30}H_{40}O_5N_2$ of (dibasic) emetine, correct results can be obtained by using an empirical factor, namely, 1 c.c. $N/40$ acid = 0.0066 gram emetine.

Hemlock is assayed by shaking vigorously 20 grams of the finely powdered leaves or seeds with a mixture of ether and chloroform (3:1), adding 10 c.c. of 10 per cent. aqueous sodium hydroxide, and shaking for 4 hours. When the liquid has cleared, 100 c.c. are removed with a pipette, mixed with 10 c.c. of 2 per cent. alcoholic oxalic acid, and evaporated on the water-bath, air being blown through the flask finally to remove the last traces of liquid. The residue is then treated with 10 c.c. of absolute alcohol and filtered into a beaker, the filter and undissolved ammonium oxalate being washed with absolute alcohol. The filtrate is concentrated on the water-bath to 2—3 c.c., mixed with 10 c.c. of water, and diluted with water to 25 c.c. in a small graduated flask, shaken vigorously with a little talc, and filtered through a dry filter. Of the filtrate, 12.5 c.c. (= 5 grams of the drug) are removed with a small pipette to a separating funnel, and mixed with excess of 10 per cent. aqueous sodium hydroxide; the alkaloid is extracted by shaking three times with light petroleum (distilling below 60°, without residue), 25 c.c. being used each time. The extract is shaken for about 10 minutes with about half a gram of calcined magnesia, filtered, the residue and filter being washed with light petroleum, the filtrate mixed with 50 c.c. of a saturated solution of hydrogen chloride in dry ether and distilled to dryness, air being

blown through the flask finally. The residue is mixed with 25 c.c. of *N*/40 silver nitrate, and about 5 c.c. of 10 per cent. nitric acid, diluted to 100 c.c. when the silver chloride has settled, filtered, and 50 c.c. of the filtrate mixed with about 5 c.c. of iron alum solution, and titrated with *N*/40 potassium thiocyanate. The c.c. of *N*/40 silver nitrate used per 5 grams of the drug are multiplied by 0.0635, and the result is the percentage of alkaloid in the drug, calculated as coniine.

The estimation of the total alkaloids in the fluid extract of cinchona has been described already (Abstr., 1900, ii, 777). For the estimation also of the alkaloids soluble in ether, 10 c.c. of the extract are diluted to 50 (? 100) c.c. with 2 per cent. sulphuric acid, shaken with a little talc, and filtered through a dry filter; 50 c.c. of the filtrate (= 5 c.c. of the extract) are made strongly alkaline with aqueous sodium hydroxide, and shaken three times with ether-chloroform (3 : 1). The extract is shaken with a little calcined magnesia, filtered into a tared flask, and the total alkaloids determined gravimetrically, those soluble in ether volumetrically, either *N*/20 or *N*/10 acid being used to take up the latter.

C. F. B.

Volumetric Estimation of Morphine by means of Potassium Iodate and Arsenious Acid in Alkaline Solution. By C. REICHARD (*Chem. Zeit.*, 1901, 25, 328—329).—The solution containing the morphine salt is mixed with potassium iodate and dilute sulphuric acid, and the liberated iodine extracted by repeated agitation with carbon disulphide or chloroform. The extract is then mixed with solution of potassium iodide, and gently heated on the water-bath until the carbon disulphide or chloroform has evaporated. The remaining iodine solution (if preferred, the original solution in carbon disulphide or chloroform may be taken) is mixed with excess of standard arsenious acid, and the excess of arsenic titrated with standard iodine, with the usual precautions. One atom of iodine liberated is equivalent to 3 mols. of morphine.

The author is engaged in estimating morphine by means of an ammoniacal solution of silver chloride (compare this vol., ii, 140).

L. DE K.

Detection of Indican in Urine containing Iodides. By A. KÜHN (*Chem. Centr.*, 1901, i, 800—801; from *Münch. med. Woch.*, 48, 52).—For urine containing iodides, Obermayer's ferric chloride and hydrochloric acid test is preferable to Jaffé's method, as it is somewhat less sensitive to iodides, not being affected by 1 part of potassium iodide in 10,000, whilst Jaffé's method and the starch reaction will both show that amount. Neither reagent will detect 1 part of iodide in 100,000. The use of sodium thiosulphate is recommended as a means of discriminating between iodine and indican, but no details are given.

M. J. S.

Estimation of Urinary Indican as Indigo-Red by means of Isatin and Hydrochloric Acid. By JACOB BOUMA (*Zeit. physiol. Chem.*, 1901, 32, 82—93. Compare Abstr., 1900, ii, 700).—The following method is recommended for the estimation of indoxyl in urine. The urine is first treated with lead acetate (1 vol. to 10 vols. of urine) and the clear filtrate mixed with its own volume of isatin

solution (20 grams in 1 litre of concentrated hydrochloric acid). The mixture is warmed on the water-bath for 15 minutes, cooled, extracted with chloroform, the chloroform evaporated, and the residue dried at 110° ; this residue is extracted with boiling water to remove any excess of isatin, again dried, treated with sulphuric acid, and then titrated with potassium permanganate which has been standardised by the aid of pure indigo-red. For the titration, the amount of indigo-red should not be less than 1 in 20,000, and the solution must be perfectly clear. The amount of indigo found is double that which would have been given by the indoxyl alone, as one mol. of isatin condenses with one mol. of indoxyl to yield indigo. A colorimetric method for the estimation of urinary indican for clinical purposes is also described.

J. J. S.

New Reaction of "Saccharin" (*o*-Benzoicsulphinide). By ALEXANDRE LEYS (*Compt. rend.*, 1901, 132, 1056—1058).—A warm, dilute solution of hydrogen peroxide containing a trace of a copper or ferric salt produces an intense brown coloration and precipitate with organic compounds containing unsaturated rings; this reaction takes place with benzene, pyrrole, thiophen, furfuraldehyde, antipyrine, "saccharin," acetanilide, *o*-phenylenediamine hydrochloride, benzoic and cinnamic acids, and the phenols and their carboxy-derivatives, negative results being obtained with alcohol, sucrose, allyl acetate, menthol, turpentine, and acetic, lactic, and fumaric acids. In the case of "saccharin," the addition of a mineral acid prevents the formation of the brown compound, a trace of acid removes the yellow tint of the coloration, and when the reaction is carried out in the cold, a violet coloration slowly develops constituting a very delicate test for the sweetening principle. Milk is examined for "saccharin," after precipitating the casein by means of potassium hydrogen sulphate and alcohol, by extraction with ether, removal of the solvent by evaporation and examination of the residue dissolved in water by means of cold dilute solutions of hydrogen peroxide and ferric chloride. Butter is treated with a mixture of chloroform, alcohol, and water, and the dilute alcoholic extract examined as in the preceding example; the violet coloration produced should not appear on the addition of ferric chloride, but only after the introduction of hydrogen peroxide.

G. T. M.

Cell for the Clinical Determination of Hæmoglobin in Urine. By PAUL ADAM (*Bull. Soc. Chim.*, 1901, [iii], 25, 607—608).—A short account of a glass cell for the spectroscopic examination of liquids; it is made in a mould, the exterior faces being afterwards planed and polished.

N. L.

Colorimetric Estimation of Hæmoglobin. By JOHN S. HALDANE (*J. Physiol.*, 1901, 26, 497—504).—Hæmoglobin can be easily and accurately estimated in terms of its oxygen capacity, by means of a standard solution of carbonic oxide hæmoglobin. The standard is permanent when properly sealed. The Gowers' hæmoglobinometer, provided with this standard gives good results. The average oxygen capacity of the blood is 18.5 per cent. in adult healthy men, 16.5 in women, and 16.1 in children.

W. D. H.

General and Physical Chemistry.

Molecular Refraction of Chloral Hydrate in Solution in various Solvents. By MAX RUDOLPHI (*Zeit. physikal. Chem.*, 1901, 37, 426—447).—From the results of an examination of chloral hydrate in solution in water, alcohol, or toluene, no preference can be given to any of the four formulæ which have been suggested for determining molecular refraction from the refractive index. The refraction deduced from the aqueous and alcoholic solutions agrees well with that calculated from the atomic refractions, but not so well with the observed refraction of superfused chloral hydrate. Observations in toluene lead to a considerably higher molecular refraction. The solvent, therefore, may exert a great influence on the refraction, and this cannot be traced to electrolytic dissociation. Toluene has nearly the same index of refraction as chloral hydrate, and yet is the most anomalous of the solvents used, and this confirms Brühl's observation (*Abstr.*, 1897, ii, 129) that optical similarity is no guide as to the usefulness of a particular solvent for the determination of the refraction of the dissolved substance. J. McC.

Arc Spectrum of Vanadium. By SIR NORMAN LOCKYER and F. E. BAXANDALL (*Proc. Roy. Soc.*, 1901, 68, 189—210. Compare Hasselberg, *Abstr.*, 1900, ii, 381).—The sources of the spectra were (1) vanadium chloride, (2) vanadium oxide, each volatilised between poles of pure silver. A full list of the lines is given and compared with the lists of Rowland and Harrison, and Hasselberg. The authors have detected 194 lines that do not appear in either of these lists.

J. C. P.

Triboluminescence. By L. TSCHUGAEFF (*Ber.*, 1901, 34, 1820—1825).—Triboluminescence denotes the property possessed by some crystalline substances of becoming luminous when rubbed or struck (compare Wiedemann, *Ann. Phys. Chem.*, 1888, [ii], 34, 446). The author has subjected about 500 organic and inorganic substances to these conditions, and found that 25 per cent. (chiefly organic) show this behaviour. The property seems peculiarly associated with ring compounds, and the intensity of the light emitted is greatest in these cases; certain groups, namely, hydroxyl, carbonyl, and secondary or tertiary nitrogen, specially favour the production of triboluminescence. Of the alkaloids or alkaloid salts investigated, 65 per cent. possess the property. The substances examined are divided into classes, accordingly as the intensity of the light emitted is approximately that of (1) uranium nitrate, (2) tartaric acid, or (3) ammonium oxalate. Triboluminescence of the first degree is exhibited by uranium nitrate, quinine valerate, cocaine salicylate, cinchonamine, coumarin, and aniline hydrochloride. The colour of the light emitted varies with the substance examined, and the luminosity generally lasts only so long as external force is applied; in certain cases, however, such as acetanilide and sulphanilic acid, the luminosity lasts longer. The author's

results point to a close connection between triboluminescence and optical activity (compare Andreocci, *Abstr.*, 1899, ii, 719).

J. C. P.

Contact Electromotive Forces and the Theory of Ions. By E. ROTHÉ (*Compt. rend.*, 1901, 132, 1478—1481).—A Lippmann electrometer was employed, and the *E.M.F.*'s necessary to obtain the maximum height of the mercury in the electrometer were determined, the solutions employed being saturated solutions of mercurous chloride and sulphate in hydrochloric and sulphuric acids of varying concentrations. The *E.M.F.* was found to increase with the concentration of the acid, a result in accord with the theory of Nernst, and values of the *E.M.F.* calculated by Nernst's formula agree well with the experimental determinations.

L. M. J.

Electromotive Relations of Compounds with several Oxidation Stages. By E. ABEL (*Zeit. physikal. Chem.*, 1901, 37, 623—625).—A discussion of some of the results obtained by Luther (this vol., ii, 301).

L. M. J.

Electrical Conductivity of Air and Salt Vapours. By HAROLD A. WILSON (*Proc. Roy. Soc.*, 1901, 68, 228—230. Compare *Abstr.*, 1899, ii, 722).—The relation between the current and the *E.M.F.* in air depends very much on the direction of the current, namely, whether the outer electrode is positive or negative. With salt vapours, the relation between current and *E.M.F.* is not much affected by reversing the current; at low temperatures, the current attains a saturation value, but above 1000° it increases more nearly in proportion to the *E.M.F.*

For air, the relation of current and temperature at constant *E.M.F.* may be expressed by a formula of the type $C = A\theta^n$, where C is the current, θ the absolute temperature, A and n constants, the value of n depending on the *E.M.F.* used. The energy required to ionise 1 gram-mol. of air between 1000° and 1300° is estimated to be 60,000 cal.

For salt vapours, the relation between current and temperature is complicated; the current shows a maximum value about 900°, and increases very rapidly about 1150°. The energy required to ionise 1 gram-mol. of potassium iodide is estimated to be 15,000 cal. at about 300°.

The maximum current carried by the salt vapour (at 1300° and 800 volts) is nearly equal to that required to electrolyse the same amount of salt in solution—a fact in favour of the view that the ions are of the same nature in the two cases.

J. C. P.

Electrical Conductivity in Gases exposed to the Action of Cathode Rays. By J. C. McLENNAN (*Zeit. physikal. Chem.*, 1901, 37, 513—545).—The conductivity of gases under the influence of cathode rays may be completely explained on the hypothesis that positive and negative ions are produced in the gas. By the action of cathode rays on an insulated conductor, positive charges are completely dissipated, whilst uncharged or negatively electrified conductors

retain a residual negative charge. In the author's experiments, the effects are due, not to the Röntgen, but to the cathode rays. Methods for the determination of the extent of the ionisation in gases are considered, and experiments with air, nitrogen, carbon dioxide, hydrogen, and nitric oxide show that the ion concentration with constant cathode rays is proportional to the density of the gas and independent of its chemical nature. Ionisation in the same gas at different pressures is similarly proportional to the pressure, whilst in all cases it is further shown that the ionisation is directly proportional to the energy absorbed.

L. M. J.

Degree of Dissociation and Dissociation Equilibrium in the case of Highly Dissociated Electrolytes. By HANS JAHN (*Zeit. physikal. Chem.*, 1901, 37, 490—503. Compare Abstr., 1900, ii, 707).—Provided that $C^2/(c - C) = \text{const.}$, where c is the total concentration and C the concentration of the free ions, then Nernst's formula for the calculation of the *E.M.F.* of a concentration cell can be derived from the exact formula of Arrhenius. The author finds, from results of Loomis (Abstr., 1896, ii, 352), Hausrath (*Inaug. Diss. Göttingen*, 1901), and Abegg (Abstr., 1896, ii, 587), that for the chlorides and nitrates of potassium, sodium, and ammonium, $C^2/(c - C) \cdot \lambda^{-c} = \text{const.}$ (λ being a constant for each substance). As the concentration decreases, the value of λ^{-c} approaches unity, and therefore for very dilute solutions $C^2/(c - C) = \text{approx. const.}$ Nernst's formula is only accurate when dilute solutions are employed in the cell, but even when the solutions are concentrated, the formula introduces only a very small error, and one quite incapable of explaining the large deviation between the experimentally determined *E.M.F.* and that calculated with the aid of μ/μ_∞ for various concentration cells.

The author suggests that the apparent inapplicability of the law of mass action to solutions of strong electrolytes may be due to an influence which charged ions exert on each other, there being no such influence between neutral molecules at high dilution.

J. McC.

Electrically Heated and Electrically Controlled Thermostat. By STEWART W. YOUNG (*J. Amer. Chem. Soc.*, 1901, 23, 327—330).—The author has devised an electrical thermostat in which the heating is effected by incandescent lamps and regulated by a modification of the ordinary gas regulator; by means of this apparatus, the temperature can be maintained within 0.02—0.03 of a degree. For details, the description and diagram in the original must be consulted.

E. G.

Gradual change of Glass and the variation of the Zero point of Thermometers. II. Accurate Thermometry. By L. MARCIS (*Zeit. physikal. Chem.*, 1901, 37, 553—604; 605—612).—The first paper is an extension of the author's previous paper on this subject (Abstr., 1899, ii, 545), whilst in the second paper the application of the results obtained to thermometry are discussed. The usual precautions observed are theoretically justified, but it is shown that multiplicity of alternate heating and cooling is unnecessary for bringing the thermometer to the natural state. A precaution of the utmost

importance is the maintenance of the thermometer at a temperature close to that of the experiments during the intervening periods.

L. M. J.

Specific Heats of Alloys. By DOMENICO MAZZOTTO (*Nuovo Cimento*, 1901, [v], 1, 355—357).—The discordance between the numbers given by Spring and by the author for the specific heat of Lipowitz's alloy, recently referred to by van Aubel (*J. de Physique*, [iii], 1900, 9, 493), is due to the different behaviour of the alloy according as it is previously heated above or below its melting point. In the former case, widely differing values are obtained for the specific heat for various ranges of temperature, whilst in the latter case the different numbers vary only from 0.0351 to 0.0359, the mean value being 0.0354.

T. H. P.

Latent Heats of Evaporation of some Organic Nitrogenous Compounds. By LOUIS KAHLENBERG (*J. Physical Chem.*, 1901, 5, 284—288).—The specific heats and latent heat of evaporation were determined for amylamine, dipropylamine, diisobutylamine, valeronitrile, and α -picoline. The results obtained were:

Compound.	Specific heat.	Latent heat.	ML/T.
Amylamine.....	0.6136	98.75	23.3
Dipropylamine	0.5972	75.69	20.0
Diisobutylamine.....	0.5706	65.85	20.8
Valeronitrile	0.5199	95.95	19.8
α -Picoline	0.4342	90.75	21.0

The value of Trouton's constants appears to indicate a certain amount of association in the molecules of amylamine, but simple molecules in case of the other compounds (compare Abstr., 1898, ii, 269).

L. M. J.

Phosphorus Oxychloride as a Solvent in Cryoscopy. By GIUSEPPE ODDO (*Atti Real. Accad. Lincei*, 1901, [v], 10, i, 452—458).—The mol. depression of the freezing point of phosphorus oxychloride is found by measurements with solutions of toluene, sulphur monochloride, and bromine to have the value 69; tetrachloromethane gives a slightly higher number. In dilute solution in phosphorus oxychloride, aniline hydrochloride, pyridine hydrochloride, ferric chloride, platinum tetrachloride, and gold trichloride all undergo dissociation, giving approximately half the calculated molecular weights.

T. H. P.

Freezing Point of Aqueous Solutions of Non-electrolytes. II. By ELMER H. LOOMIS (*Zeit. physikal. Chem.*, 1901, 37, 407—425. Compare Abstr., 1900, ii, 335).—The zero point of the thermometer which has been in use in this investigation during the past seven years has constantly risen. The rise was continuous, and so slow as to be without influence on the results; only in one instance was a sudden change (from $+0.0538^{\circ}$ to $+0.0521^{\circ}$) observed.

The non-electrolytes investigated were lactose, maltose, levulose, dulcitol, acetamide, and salicin. The mol. depression (calculated from m , the number of gram-mol. per 1000 c.c. of solution) increases regularly

with rise of concentration from $m = 0.01$ to $m = 0.2$. If the mol. depression (corrected mol. depression) be calculated from m' , the number of gram-mol. of dissolved substance in 1000 grams of water, it is found to remain constant for all concentrations of lævulose (1.86), and dulcitol (1.85), as well as for methyl and ethyl alcohols, dextrose, mannitol, glycerol, and chloral hydrate previously examined; it increases gradually, with increasing concentration, in the cases of lactose (1.86 to 1.88), and maltose (1.86 to 1.89), as well as of sucrose; it exhibits a continuous diminution for acetamide (1.83 to 1.81) and salicin (1.86 to 1.84), *n*-propyl, *n*-butyl, and amyl alcohols, acetone, and aniline.

The fact that molecular solutions of a large number of non-electrolytes at high dilution have the same freezing point shows that they have also the same osmotic pressure, and consequently Avogadro's hypothesis is strictly applicable to dilute solutions. It is shown that as in many cases the corrected mol. depression remains constant over a wide range of concentration, van't Hoff's assumption that the osmotic pressure follows the laws of Boyle and Gay-Lussac is correct. An analogy is drawn between those substances for which the corrected molecular depression does not remain constant and gases which do not obey Boyle's law.

From results with aniline and many other aromatic substances, it is concluded that benzene compounds exist in aqueous solution in the form of molecular aggregates, and that the association of these increases with the concentration.

As in no case does the mol. depression at great dilution exceed 1.86, there is no evidence of the slightest dissociation of any non-electrolyte examined.

J. McC.

Molecular Depression of the Temperature of Maximum Density of Water produced by the dissolution of Chlorides, Bromides, and Iodides of the Alkali Metals. By LOUIS C. DE COPPET (*Compt. rend.*, 1901, 132, 1218—1220).—It was found that the depression is approximately proportional to the quantity of dissolved salt, and that the molecular depression is hence approximately constant, the value differing, however, for different salts, as seen in the following table:

	Chloride.	Ratio.	Bromide.	Ratio.	Iodide.
Rubidium	11.7°	0.89	13.2°	0.85	15.6°
Potassium	11.6	0.91	12.8	0.83	15.4
Sodium	13.2	0.91	14.5	0.85	17.0
Lithium	6.0	0.86	7.0	0.84	8.3
Ammonium.....	7.2	0.83	8.7	0.78	11.1

The ratio of the depressions produced by chlorides and bromides, or iodides, is approximately independent of the metal (*Abstr.*, 1899, ii, 590).

L. M. J.

Connection between Surface Tension and Solubility. By GEORGE A. HULETT (*Zeit. physikal. Chem.*, 1901, 37, 385—406).—Precipitates, when first formed, consist of very small particles which gradually become larger, the growth taking place by the solution of the smallest particles. In this way, the solution becomes supersaturated

with respect to larger particles, and there is, consequently, deposition of solid on the larger particles. Ostwald has shown that this is due to surface energy, which tends to a minimum.

This necessitates that the solubility of a solid should be dependent upon the state of division of the solid with which the solution is in contact. Experiments with calcium sulphate have confirmed this, as it has been found that variation in the size of the particles employed for solution leads to variations in the concentration, which can be detected by conductivity determinations. A normally saturated solution of gypsum at 25° contains 2.085 grams of calcium sulphate per litre, the size of the particles being not less than 2μ ($\mu = 0.0001$ cm.). If the particles are smaller (0.3μ), the concentration of the saturated solution rises to 2.476 grams of calcium sulphate per litre. The concentration of this latter solution quickly falls to the lower concentration, and the particles increase in size. The same relationships were found with barium sulphate; the saturated solution has the concentration 2.29 mg. per litre at 25° ($\mu = 1.8$), but when $\mu = 0.1$, the solution contains 4.15 mg. per litre. By still further reducing the size of the particles, the solubility was increased by 20 per cent.

Ordinary coarse mercuric oxide is soluble to the extent of 50 mg. per litre at 25°, but when very finely powdered the solubility increases to 150 mg. per litre (determined colorimetrically).

The author has also calculated the surface energy between solid and solution.

J. McC.

Internal Friction of Solutions of Chrome Alum. By EFISIO FERRERO (*Nuovo Cimento*, 1901, [v], 1, 285—287).—In order to determine whether the change in colour from reddish-violet to green produced in chrome alum solution by heating is accompanied by an alteration in the internal friction of the liquid, the author has measured the latter magnitude for two solutions containing respectively 20.5 and 13.75 per cent. of the alum. In each case, the liquid was heated to a certain temperature, then cooled to 20.5°, and the measurement made at this temperature. The numbers obtained show that the internal friction of chrome alum solutions begins to undergo a gradual diminution when heated to about 55°, a temperature corresponding approximately with the change in colour from violet to green; this diminution continues until the temperature reaches about 80°, above which the internal friction has a constant value. The difference between the values of the internal friction for the green and violet solutions diminishes with the concentration.

T. H. P.

Influence of Acids on the Solubility of Salts containing the same Ion. By J. E. ENKLAAR (*Rec. Trav. Chim.*, 1901, 20, 183—197).—The solubility of sodium chloride in water containing various quantities of hydrochloric acid at 10° and 10.5° has been determined. Assuming that these two electrolytes are dissociated to the same extent, the solubility of the sodium chloride should be expressed by $m = -x/2 + \sqrt{m_0^2 + x^2/4}$, x being the concentration of the hydrochloric acid and m_0 being the solubility of sodium chloride in pure water; this follows from the assumption that the product of the con-

centrations of sodium and chlorine ions is constant. The solubility found is always less than that calculated, and the difference is proportional to the amount of hydrochloric acid present. The sum ($x + m$) is almost constant and equal to m_0 . The diminution of the solubility is possibly to be explained by the contraction which the water suffers by the presence of the free ions of the hydrochloric acid.

Similar relationships have been found at 27° and 41°, and also with barium chloride in hydrochloric acid and barium nitrate in nitric acid. The solubility of sodium acetate is hardly affected by the presence of acetic acid. J. McC.

Catalysis. III. Theory of Contact Action. By HANS EULER (*Öfver. K. Vetens. Akad. Förhandl.*, 1900, 57, 267—276).—In earlier papers, the author has enunciated the principle that in every case of catalysis there is an increase in the number of the ions concerned in the reaction. It is now shown how this principle applies in the case of contact action, especially in that of platinum catalysis. All reactions accelerated by platinum are oxidation or reduction processes, and the author connects the catalytic effect of platinum black with its great power of absorbing and retaining oxygen and moisture (compare Mond, Ramsay, and Shields, *Abstr.*, 1895, ii, 492). When platinum black is carefully reduced by gently warming in a current of hydrogen, its catalytic effect on the decomposition of hydrogen peroxide is seriously impaired. Bredig and Müller von Berneck (*Abstr.*, 1900, ii, 213) have shown that the reaction $\text{H}_2\text{O}_2 + \text{O} = \text{H}_2\text{O} + \text{O}_2$ is monomolecular, whence it follows that oxygen atoms take part in the reaction, and that their concentration remains constant. The ionisation of the oxygen at the surface of the platinum is to be attributed to the presence of water and to the high absorption pressure. J. C. P.

Catalysis of Electrolytic Gas by Colloidal Platinum. By CARL ERNST (*Zeit. physikal. Chem.*, 1901, 37, 448—484).—Bredig's colloidal platinum solution exerts a catalytic influence on electrolytic gas, and the product is quite free from ozone and hydrogen peroxide. The diminution in the gas volume per unit of time is directly proportional to the absolute amount of platinum in the solution and to the concentration (pressure) of the gas mixture. If hydrogen and oxygen be mixed in proportions other than 2:1, the excess of one of the gases appears to act merely as a diluent. A satisfactory constant has been found for $k = C \cdot \Delta t / \Delta v$, where C is the concentration of the mixture ($2\text{H}_2 + \text{O}_2$), Δt the time interval, and Δv the diminution in volume.

The author believes that the reaction may be accounted for in the same way that Bodenstein (unpublished) explains the catalysis of electrolytic gas by platinum foil: the assumption made is that the diminution in volume measures the rate of absorption of the two gases by the platinum which thereafter combine, but this diminution does not measure the rate of combination of the hydrogen and oxygen.

Finally, it has been shown that those substances which "poison" colloidal platinum solution for the decomposition of hydrogen peroxide (Bredig and Müller von Berneck, *Abstr.*, 1900, ii, 213; Bredig and

Ikeda, this vol., ii, 441) exert a similar retarding effect on the catalysis of electrolytic gas.

J. McC.

The Paralysing of Platinum Catalysis by "Poisons." By ROBERT W. RAUDNITZ (*Zeit. physikal. Chem.*, 1901, 37, 551—552).—It is shown that the catalytic decomposition of hydrogen peroxide, which is hindered by the addition of hydrocyanic acid, takes place with undiminished energy if the acid is removed by blowing a current of air through the liquid, so that the catalyst has not been affected. The effect of the "poison" is probably analogous to that of those compounds which diminish the luminosity of phosphorus or the oxidation of sodium sulphite (compare Bredig and Ikeda, this vol., ii, 441).

L. M. J.

Absorption of Water Vapour by definite Chemical Compounds; Distribution of the Absorbed Water between two Similar and two Dissimilar Substances. By W. I. BUSNIKOFF (*J. Russ. Phys. Chem. Soc.*, 1901, 33, 412—427. Compare Abstr., 1899, ii, 360, 409, and this vol., ii, 58).—The author has extended his observations to the cases of (1) three different quantities of sulphuric acid of the same concentration placed under the same bell jar in presence of water, and (2) of three and (3) four quantities of aqueous sulphuric acid of different concentrations placed under the same bell jar. Certain relations are drawn between the rate at which water is lost or gained by the various solutions and the number of molecules of water they contain.

T. H. P.

Influence of Non-Electrolytes on the Hydrolysis of Ethyl Acetate. By CARL KULLGREN (*Zeit. physikal. Chem.*, 1901, 37, 613—622).—The influence of various compounds on the velocity of hydrolysis of ethyl acetate by sodium hydroxide solutions was investigated at the temperature of 20.7°. The compounds employed were sucrose, glycerol, methyl alcohol, ethyl alcohol, and acetone; it was found that the effect of the first two was far greater than that of the other compounds, 5 per cent. of sucrose lowering the reaction constant to the extent of 73 per cent. In this case, the results are completely explained by the supposition that sodium succinate is formed, and it is probable that in the case of glycerol also chemical action takes place. The effect of the compounds is far less marked and cannot be ascribed to chemical action; the lowering of the dissociation of the sodium hydroxide and the increase of internal friction are insufficient to account for the lowering of the velocity, which the author considered is best explained by the assumption of active and inactive molecules of ethyl acetate, the number of the latter being increased by the substitution of other compounds for water.

L. M. J.

Action of Bases and Acids on Salts of the Amines. By ALBERT COLSON (*Compt. rend.*, 1901, 132, 1563—1565. Compare Abstr., 1897, ii, 314).—An interaction between dry ammonia gas and piperidine hydrochloride takes place at 0° when the pressure is 1255 mm., and the organic base is liberated. If the pressure is subsequently lowered, the reaction is not completely reversed because of the formation of compounds of the type $\text{NH}_4\text{Cl}_n\text{NH}_3$; on the other

hand, the inverse change is brought about by adding 1 mol. of piperidine to 1 mol. of ammonium hydrochloride; the action is instantaneous, and the pressure produced is practically equal to that required for the direct decomposition. The interaction does not take place at the ordinary temperature when the substances are perfectly dry, but an action sets in at 100° or on introducing a trace of water. The hydrochlorides of diisobutylamine and piperidine absorb hydrogen chloride, giving rise to products which are liquid at 20° . The vapour pressure of diisobutylamine dihydrochloride at 34° is only 760 mm.

This property of absorbing hydrogen chloride seems to depend on chemical constitution rather than on the avidity of the base. Ammonia is intermediate in strength between diisobutylamine and piperidine, but its hydrochloride does not absorb hydrogen chloride, even at -21° and under a pressure of 3154 mm. G. T. M.

Racemisation. By JULES MINGUIN and E. GRÉGOIRE DE BOLLE-MONT (*Compt. rend.*, 1901, 132, 1573—1576. Compare Kipping and Pope, *Trans.*, 1897, 51, 989; 1899, 55, 36).—The racemic modifications of benzylidenecamphor, bornyl succinate, chloral campholate, bromal campholate, and benzylbromocamphor crystallise in forms differing from those of their active components; the active and racemic modifications of benzylidenebromocamphor and anisylidenecamphor are crystallographically identical. These racemic compounds with the exception of *r*-benzylbromocamphor are more soluble than their active components, and have lower melting points and sp. gravities. In every case, the determination of the molecular weight by the cryoscopic method indicates that the racemic compounds have simple molecular weights. When the racemic and active modifications differ in crystalline form, it is found that a mixture of the two substances in equal proportions melts at a temperature lower than the melting point of the more fusible component; when the active and inactive substances are isomorphous, the mixture melts at a temperature intermediate between the melting points of its constituents. This difference serves to distinguish between racemic and pseudoracemic compounds, benzylidenebromocamphor and anisylidenecamphor belonging to the latter category, whilst the other inactive substances enumerated are truly racemic. G. T. M.

Invariant Theory for Chemists. By E. STUDY (*Zeit. physikal. Chem.*, 1901, 37, 546—550).—A criticism of the utility of the invariant theory of Gordan and Alexéeff (this vol., ii, 13). L. M. J.

Relations between Atomic Weight, Atomic Volume, and Melting Point. By THOMAS BAYLEY (*Chem. News*, 1901, 83, 243—245. Compare *Abstr.*, 1900, i, 369; ii, 188).—An exhaustive table is published exhibiting a connection between the atomic volume and the absolute melting point of various pairs of elements, and the "critical points" previously (*Chem. News*, 1887, 78, 157) defined by the author. J. C. P.

Titration of Acids and Alkalis of Complex Function. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1901, 132, 1377—1382).—An examination, by titration, of the acid or alkaline functions of

certain complex acids and bases found in the human body or its secretions, namely, glycocine, leucine, *o*-, *p*-, and *m*-aminohydroxybenzoic acids, aspartic acid, hippuric acid, taurine, uric acid, and mixtures of uric acid with phosphates, using litmus, methyl-orange, phenolphthalein, and Poirrier's blue, C_4B , as indicators. C. H. B.

Inorganic Chemistry.

New Explosive and Detonating Materials. V. By UGO ALVISI (*Gazzetta*, 1901, 31, i, 221—243. Compare Abstr., 1900, ii, 205).—The author gives calculations of the potential energy of a hypothetical mixture of potassium nitrate, ammonium nitrate, potassium chlorate, potassium perchlorate, or ammonium perchlorate with hydrogen. The results show that, leaving out potassium chlorate and perchlorate, the explosive mixtures of which with hydrogen have a potential energy comparable with that of nitroglycerol, ammonium perchlorate has the highest potential energy of the oxidising salts. Further, explosive mixtures having ammonium perchlorate as their basis are entirely resolved at the moment of explosion into gaseous products, and thus develop a far greater pressure than is possible in the case of potassium chlorate or perchlorate mixtures. The following table gives roughly the propulsive forces of various black powders:

Ordinary black powder.....	1
Black powder with potassium chlorate	2 (about)
" " " perchlorate	2.4 (,,)
Powder of ammonium perchlorate, sulphur, and carbon.	3.

Ammonium chlorate would give effects surpassing those obtained with the perchlorate if it could be prepared in a stable and manageable form.

Calculations have also been made of the potential energy and volume of gas after explosion of detonating and explosive mixtures of ammonium perchlorate with picric acid, mercury fulminate, charcoal, sulphur, sulphur and carbon, cellulose, various nitrocelluloses, or with finely divided metals such as zinc and aluminium. The numbers obtained show that ammonium perchlorate mixtures compare favourably with other explosives and are to be preferred to dynamite.

The results of the author's calculations, although necessarily approximate, bear out his experimental data (*loc. cit.*). T. H. P.

Constitution of Water. By HUGO WITT (*Öfver. K. Vetens. Akad. Förhandl.*, 1900, 57, 63—83).—The author works out more fully a theory previously advanced by de Coppet and by Röntgen as to the constitution of water. According to this theory, water consists mainly of double molecules, $(H_2O)_2$, and more complex molecules, $(H_2O)_n$, "ice molecules," whilst the number of simple molecules, H_2O , is small

at low temperatures. By calculations based on Ramsay and Shields' association factor for water, the author finds that the most probable value for n is 8. It is further shown that when a substance is dissolved in water, the number of double molecules increases at the expense of the "ice molecules," and on the supposition that the latter have the same specific volume as ice, the theory explains the contraction which accompanies solution. The theory also interprets satisfactorily the displacement of the temperature of maximum density in solutions, the small specific heat of aqueous solutions, the absorption of heat accompanying solution, the abnormal lowerings of the vapour pressure, and the excessive increase of osmotic pressure with the concentration (compare also van Laar, *Abstr.*, 1900, ii, 189).

J. C. P.

Density of Ozone. By ALBERT LADENBURG (*Ber.*, 1901, 34, 1834. Compare this vol., ii, 232 and 380).—The author denies the validity of Otto's claims to priority.

J. J. S.

New Mode of Formation of Wöhler's Blue (or Green) Sulphur. By N. A. ORLOFF (*J. Russ. Phys. Chem. Soc.*, 1901, 33, 397—399).—The action of sulphur monochloride in benzene solution on metallic sulphides, especially bismuth sulphide, yields a green powder which, when dried or when treated with alcohol, becomes yellow; it is insoluble in water or acids, melts and, when heated, burns leaving an inappreciable residue, and has all the properties of precipitated sulphur. The green powder, which is only stable when kept under benzene, the author considers to be identical with the blue modification of sulphur obtained by Wöhler by the interaction of solutions of ferric chloride and hydrogen sulphide. The author has also obtained, by means of bismuth sulphide, a green variety of sulphur which becomes perfectly white on drying and contains a small quantity of bismuth chloride; similar results are obtained with zinc and cadmium sulphides.

T. H. P.

Formation of the Green Variety of Sulphur. By N. A. ORLOFF (*J. Russ. Phys. Chem. Soc.*, 1901, 33, 400—403. Compare preceding abstract).—The author draws an analogy between the formation of Wöhler's blue modification of sulphur by the oxidation of hydrogen sulphide with ferric chloride and the formation of ozone by oxidising water with fluorine.

A number of experiments have been made to determine the conditions of formation of green sulphur (*loc. cit.*). Besides by the action of sulphur monochloride on metallic sulphides in benzene solution, it is formed, only in smaller quantity, by the interaction of these compounds in the absence of any solvent. The influence of various solvents has also been investigated.

The green modification of sulphur is amorphous, and is not soluble in any solvent except carbon disulphide, to which it imparts but a pale green tint. It loses its colour when dried or when acted on by water, alcohol, or ether, and can only be kept under benzene, toluene, carbon disulphide, or olive oil; when placed under commercial xylene, it rapidly

acquires a blue, and afterwards a red, tint. When it is heated with persulphuric acid, the latter assumes a yellow colour; it is oxidised by hot nitric acid.

T. H. P.

Catalytic Reactions. I. Aluminium Chloride. By OTTO RUFF (*Ber.*, 1901, 34, 1749—1758).—Sulphur crystallises unchanged from sulphuryl chloride when the two substances are heated together at 130° and subsequently allowed to cool; chlorination of the sulphur only takes place at a temperature of about 200°, but in presence of aluminium chloride the reaction $\text{SO}_2\text{Cl}_2 + 2\text{S} = \text{S}_2\text{Cl}_2 + \text{SO}_2$ takes place quantitatively at temperatures between 30° and 70°, whilst with one atom of sulphur the reaction $\text{SO}_2\text{Cl}_2 + \text{S} = \text{SCl}_2 + \text{SO}_2$ takes place quantitatively at 40°; thionyl chloride is not produced under these conditions. Cinnabar does not react with sulphuryl chloride alone, but in presence of aluminium chloride is converted into mercuric chloride, which is slightly soluble in the sulphuryl chloride. The two sulphides of antimony and of tin dissolve as chlorides in sulphuryl chloride with separation of sulphur, but in presence of aluminium chloride sulphur dichloride is produced.

Sulphuryl chloride does not interact with iodine alone, but in presence of aluminium chloride or iodide the compounds ICl and ICl_3 are produced, the latter being only formed when the sulphuryl chloride is in considerable excess.

Molybdenum pentachloride readily dissolves in sulphuryl chloride to a brown solution, and is then readily reduced (by sulphur, for example) to the yellow dichloride; on adding aluminium chloride, it is immediately rechlorinated with evolution of sulphur dioxide, and, on cooling, a double-compound of molybdenum pentachloride and sulphur chloride separates from the solution.

Thionyl chloride is indifferent towards sulphur even in presence of aluminium chloride, and this behaviour can be used in order to separate it from sulphuryl chloride; the reaction $2\text{SOCl}_2 + 2\text{H}_2\text{S} = 4\text{HCl} + \text{SO}_2 + 3\text{S}$ takes place very much more vigorously when aluminium chloride is also present.

Sulphur crystallises unchanged from a solution of phosphorus pentachloride in oxychloride, but is converted into monochloride if aluminium chloride is added to the mixture.

In presence of aluminium chloride, arsenic interacts with hydrogen sulphide to form arsenious sulphide and hydrogen chloride, and also with phosphorus to form a red compound, insoluble in arsenic chloride and containing aluminium chloride; when this compound is decomposed by water, it gives a violet-black substance of the composition PAs_4O_2 (compare Janowsky's $\text{P}_2\text{As}_3\text{O}_2$, *Abstr.*, 1876, i, 681). Antimony trichloride also interacts with phosphorus in presence of aluminium chloride.

By the action of sulphur dichloride on a solution of aluminium chloride in sulphuryl chloride, a double chloride, $\text{AlCl}_3\cdot\text{SCl}_2$, is produced; it crystallises in needles, is immediately decomposed by water, and, when heated, begins to give off chlorine at 25°, loses sulphur monochloride above 65°, and finally leaves behind a hard mass of aluminium chloride.

T. M. L.

Potassium Perselenate. By LOUIS M. DENNIS and OLIVER W. BROWN (*J. Amer. Chem. Soc.*, 1901, 23, 358—359).—*Potassium perselenate* is obtained by the electrolysis of a saturated solution of potassium selenate containing a little free selenic acid; platinum electrodes are employed, and the temperature is kept at 4°. The salt has not been obtained free from the selenate, the highest percentage of perselenate in the product being 74.44. Potassium perselenate, when hot, converts manganese dioxide into potassium permanganate, and rapidly oxidises ferrous and thallous sulphates in the cold. When an aqueous solution of the salt is warmed, oxygen is evolved.

E. G.

Tellurium. By ALEXANDER GUTBIER (*Ber.*, 1901, 34, 2114—2115).—The determination of the mol. weight of telluric acid by the cryoscopic method indicates that the substance has the formula H_6TeO_6 , and not $\text{H}_2\text{TeO}_4 \cdot 2\text{H}_2\text{O}$; moreover, the acid crystallises in the hexagonal (rhombohedral) system, and not in monoclinic forms. Telluric acid is only feebly acidic, and electrical conductivity determinations show that its strength is comparable with that of hydrogen sulphide or prussic acid; it does not yield esters, and can be titrated by means of indicators. Tellurous and telluric acids, and the salts in neutral, acid, or alkaline solutions, are quantitatively reduced to tellurium by means of hydrazine hydrate. Potassium tellurate crystallises with 5 or $2\text{H}_2\text{O}$, the latter modification of the salt being isomorphous with potassium osmate, $\text{K}_2\text{OsO}_4 \cdot 2\text{H}_2\text{O}$.

The double salt of telluric acid with silver and lead nitrates do not exist (compare Oppenheim, *J. pr. Chem.*, 1857, 71, 270). The tellurates of the alkaline earth metals cannot be obtained crystalline. Tellurites are produced on melting tellurates. Telluric acid combines with aniline, but oxidises the aromatic diamines.

G. T. M.

Nitration by means of Nitrates in presence of Water. By MICHAEL I. KONOWALOFF (*J. Russ. Phys. Chem. Soc.*, 1901, 33, 393—397).—The author has made a number of experiments on the nitration of various hydrocarbons by heating them in sealed tubes with aqueous solutions of various nitrates. The results lead to the following conclusions. Nitrates of the alkali metals and of ammonia undergo little or no hydrolysis in presence of water at 125°; the concentration of the nitric acid formed must be less than 0.14 per cent. At the same temperature, bismuth, aluminium, mercury, and silver nitrates are considerably hydrolysed, the bismuth salt to the greatest extent. Thus the nitrates of the heavy metals and of aluminium may in some cases be advantageously employed in place of nitric acid as nitrating agents, and as no appreciable oxidation takes place, they would be especially valuable for the nitration of hydroxy-compounds. Boric acid or carbon dioxide at 100°, or silica at a low red heat, do not displace nitric acid to any appreciable extent from its salts. Boric acid and carbon dioxide do, however, liberate nitrous acid from nitrites, whilst oxalic and sulphuric acids set free both nitrous and nitric acids from their salts.

T. H. P.

Preparation of Phosphorus Sub-oxide. By ADOLPHE BESSON (*Compt. rend.*, 1901, 132, 1556—1557. Compare Abstr., 1898, ii, 216; 1900, ii, 539, and Michaelis and Pitsch, Abstr., 1895, ii, 285; 1900, ii, 137).—The author has again estimated the phosphorus in the oxide prepared by the action of phosphine on a cold, saturated solution of hydrogen bromide in phosphorus oxychloride, and finds that the numbers point to the formula P_2O rather than to P_4O . This oxide is also produced by oxidising phosphorus dissolved in warm phosgene with a current of dry air, and by the action of phosphorous acid on phosphorus trichloride at 100° . G. T. M.

Neutralisation of Phosphoric Acid. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1901, 132, 1277—1281. Compare Abstr., 1887, 94).—When a dilute solution of calcium hydroxide is slowly added to a dilute solution of phosphoric acid, the point of neutralisation, as indicated by methyl-orange, is attained when the acid and basic oxide are in the proportion $2H_3PO_4, CaO$. If a further quantity of the alkaline solution is quickly added to the mixture, a precipitate of $CaHPO_4$ is produced, the deposition being complete when the acid and alkali are present in mol. proportion. In the presence of excess of the alkali, the precipitate gradually alters in composition, taking up excess of calcium oxide, 1 mol. of the acid fixing 4 and even 10 CaO . When the titration is made by slowly adding the acid to the alkali, the neutral point, as indicated by methyl-orange, is reached when these reagents are in the proportion corresponding with $P_2O_5, 2CaO$; with phenolphthalein, the end-point is less definite and corresponds with 1.4 CaO . The precipitate obtained by adding excess of lime water to a solution of phosphoric acid has approximately the composition of a tetrabasic phosphate. When shaken up with water, this substance forms an emulsion which is clarified very slowly. The deposition is, however, greatly accelerated either by the addition of a saturated solution of sodium chloride, or by maintaining the mixture for 6 hours at 60° , the coagulate obtained having a composition corresponding with $H_3PO_4, 2CaO$.

When phosphoric acid is titrated with baryta water, the neutralisation point corresponds with the formation of the salt $BaO, P_2O_5, 2H_2O$, the inverse operation giving an end-point when the salt $BaHPO_4$ is precipitated.

The insoluble barium and calcium phosphates produced by double decomposition vary in composition according to the constitution of the original soluble alkali phosphate, and the amount of this reagent employed. Barium salts of the following type, $BaHPO_4, 3BaO, P_2O_5$ and $2NaOH, 2BaO, P_2O_5$, have been obtained, together with others intermediate in composition; similar compounds are known containing calcium. G. T. M.

Acidimetry of Phosphoric Acid with the Hydroxides of Calcium, Strontium, and Barium. By JACQUES CAVALIER (*Compt. rend.*, 1901, 132, 1330—1331. Compare preceding abstract).—The replacement of one of three hydrogen atoms of phosphoric acid by barium is readily indicated either by methyl-orange or *p*-nitrophenol, especially when dilute solutions of the acid and barium hydroxide are employed.

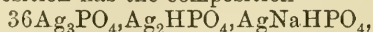
When the concentration is too great, a gelatinous precipitate of $\text{Ba}_3(\text{PO}_4)_2$ is formed, and the end point becomes uncertain. The replacement of the second hydrogen atom by further addition of barium hydroxide is clearly indicated by phenolphthalein, provided that sufficient time is allowed to permit of the gelatinous tribarium phosphate being converted into the crystalline dibarium salt; this result is attained either with dilute or concentrated solutions; in the latter case, however, it is preferable to warm the mixture in order to accelerate the production of the crystalline precipitate. Concentrated solutions of strontium hydroxide produce similar results, but in dilute solutions the formation of the crystallised distrontium salt requires several hours, and a sharp end point is obtained only in the cold. Calcium hydroxide cannot be conveniently employed instead of its barium analogue, because the crystalline salt, CaHPO_4 , is only produced with certainty when the solutions are not too dilute and when the addition of the alkali is carried out very slowly and in the cold. In dilute solutions, an end point with phenolphthalein is obtained when sufficient calcium hydroxide has been added to completely saturate the phosphoric acid; this titration is not, however, very accurate. G. T. M.

Formation of Insoluble Phosphates by Double Decomposition: Disodium Phosphate and Silver Nitrate. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1901, 132, 1449—1459. Compare preceding abstracts).—When solutions containing silver nitrate and sodium phosphate in mol. proportions are mixed at the ordinary temperature, the silver is completely precipitated; the deposit, even after repeated washing, contains small amounts of sodium and hydrogen, and has a composition corresponding with $18\text{Ag}_3\text{PO}_4, \text{Ag}_2\text{HPO}_4, \text{NaAgHPO}_4$. The filtrate is acid to phenolphthalein and alkaline to methyl-orange, requiring $\frac{1}{3}\text{NaOH}$ to produce neutrality in the first case and $\frac{1}{3}\text{HCl}$ to bring about a similar result in the second. The liquid is also alkaline to litmus, but with this indicator the end point is indefinite. Leaving out of account the presence of alkali salt in the precipitate, the foregoing double decomposition may be approximately represented by the following equation: $3\text{AgNO}_3 + 3\text{Na}_2\text{HPO}_4 = \text{Ag}_3\text{PO}_4 + \text{Na}_2\text{HPO}_4 + \text{NaH}_2\text{PO}_4 + 3\text{NaNO}_3$. The end points obtained with phenolphthalein and methyl-orange correspond with the total conversion of the soluble phosphate into disodium and monosodium salts respectively.

When the reaction is effected on the water-bath, the precipitate contains far less sodium, although this element is still present in appreciable quantity.

When 2 mols. of silver nitrate react in the cold with 1 mol. of disodium phosphate, the precipitation of the triargentic salt is not complete, the amount deposited corresponding with $0.543 \text{ Ag}_3\text{PO}_4$. The filtrate is acid both to methyl-orange and phenolphthalein, the end points being attained by the addition of $\frac{1}{3}$ and $\frac{2}{3}$ mol. of sodium hydroxide respectively. The remainder of the silver is precipitated as the liquid becomes neutral to phenolphthalein. The double decomposition may be approximately represented as follows: $2\text{AgNO}_3 + \text{Na}_2\text{HPO}_4 = 2\text{NaNO}_3 + 0.543 \text{ Ag}_3\text{PO}_4 + 0.37 \text{ AgH}_2\text{PO}_4(\text{sol.}) + 0.087 \text{ H}_3\text{PO}_4$. This equation, however, assumes that all the nitric

acid is neutralised, whereas a portion probably exists in the free state, equilibrium being established between the two acids in presence of the two basic oxides of sodium and silver. The precipitate obtained in the double decomposition has the composition



whereas that produced by the subsequent addition of sodium hydroxide corresponds with the formula $13\text{Ag}_3\text{PO}_4, \text{Ag}_2\text{HPO}_4, \text{AgNaHPO}_4$.

The solution obtained when 3 mols. of silver nitrate react with 1 mol. of disodium phosphate is acid to both methyl-orange and phenolphthalein, and in this case the amounts of sodium hydroxide required to produce neutrality are the same, namely, 1 mol. The addition of the alkali produces a second precipitate of triargentic phosphate. The course of the initial reaction may be approximately represented by the equation $3\text{AgNO}_3 + \text{Na}_2\text{HPO}_4 = 2\text{NaNO}_3 + 0.779\text{AgNO}_3 + 0.221\text{HNO}_3 + 0.603\text{Ag}_3\text{PO}_4 + 0.397\text{AgH}_2\text{PO}_4$. The precipitates obtained in this case contain only traces of sodium, and correspond in composition with the triargentic salt.

These results indicate that on mixing solutions of silver nitrate and disodium phosphate in the cold, the silver is completely precipitated when the salts react in mol. proportions, whereas the total precipitation of phosphoric acid occurs only on adding 1 mol. of sodium hydroxide to a solution which contains the reagents in the proportion $1\text{Na}_2\text{HPO}_4 : 3\text{AgNO}_3$.
G. T. M.

Reactions of Two Basic Oxides exposed simultaneously to the Action of Phosphoric Acid. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1901, 132, 1517—1525. Compare preceding abstract).—The filtrate from the mixture produced by mixing together solutions of phosphoric acid, sodium, and calcium hydroxides in the following proportions ($2\text{H}_3\text{PO}_4 : 4\text{NaOH} : \text{CaO}$) is alkaline both to methyl-orange and phenolphthalein, and it follows that the solution must contain soluble tribasic phosphates R_3PO_4 . The amounts of soluble di- and tri-basic salts are estimated by titrations with the two indicators, methyl-orange being neutral to monobasic phosphates and phenolphthalein to the dibasic compounds. The quantity of phosphoric acid (2 mols.) remaining dissolved is only 0.74 mol., whilst the precipitate contains at least 2 mols. of sodium hydroxide to 1 mol. of calcium oxide, the composition of the insoluble phosphate agreeing approximately with the formula $\text{Ca}_3(\text{PO}_4)_2, 2\text{Na}_3\text{PO}_4$. This composition is, however, based on the hypothesis that all the calcium is precipitated, an assumption which is practically correct after 48 hours. When the alkaline mixture consists of barium and sodium hydroxides in the ratio $\text{BaO} : 4\text{NaOH}$ to $2\text{H}_3\text{PO}_4$, a similar result is obtained, the insoluble phosphate containing at least 50 per cent. of the sodium; a further increase in the amount of sodium phosphate carried down is noticed when the precipitate is left in contact with the mother liquor.

The alkalis, when added to the acid in the proportions necessary to form dibasic salts ($2\text{H}_3\text{PO}_4, \text{CaO}, 2\text{NaOH}$) or ($2\text{H}_3\text{PO}_4, \text{BaO}, 2\text{NaOH}$) yield solutions which are alkaline to both indicators. In the case of the mixture containing calcium, the composition of the insoluble phosphate varies with the time. Immediately after mixing, the phosphoric

acid is divided between solution and precipitate in accordance with the following ratio : $0.48\text{R}_2\text{HPO}_4$, $0.25\text{RH}_2\text{PO}_4$ (sol. salts), $1.27\text{H}_3\text{PO}_4$ (as insoluble di- and tri-basic phosphates). After prolonged contact of the precipitate and solution, the following numbers : $0.39\text{R}_2\text{HPO}_4$, $0.29\text{RH}_2\text{PO}_4$ (soluble salts), $1.32\text{H}_3\text{PO}_4$ (as insoluble di- and tri-basic phosphates) indicate the condition of the phosphoric acid. When barium hydroxide is employed, the composition of the insoluble product is the same whether it is separated immediately or left in contact with the solution, the ratio in this case being thus indicated : $0.52\text{R}_2\text{HPO}_4$, $0.05\text{RH}_2\text{PO}_4$ (soluble salts), $1.43\text{H}_3\text{PO}_4$ (as insoluble di- and tri-basic phosphates).

These results indicate that when these mixtures of basic oxides are employed to neutralise phosphoric acid, the quantity of acid precipitated is greatly in excess of that corresponding with the calcium or barium oxide present ; in every case examined, the precipitate contains a considerable amount of sodium phosphate.

G. T. M.

Action of Cuprous Salts on Carbon Monoxide. By MARCELLIN P. E. BERTHELOT (*Ann. Chim. Phys.*, 1901, [v], 23, 32—39).—See this vol., i, 493.

Repelling of the Ionisation of Solutions of Sodium Hydroxide, Carbonate, and Hydrogen Carbonate by Addition of Sodium Chloride. By A. SMITS and L. K. WOLFF (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 4, 42—44).—Starke (this vol., i, 242) found that (1) addition of dilute sodium hydroxide to a 15 per cent. sodium chloride solution gave a more alkaline solution than when it was added to water. (2) With sodium carbonate and sodium hydrogen carbonate, the result was the same. He also stated (3) that sodium chloride cannot be precipitated from its strong solution by concentrated sodium hydroxide solution.

These experiments have been repeated, and the results (1 and 2) are confirmed provided that the solvent water contains carbon dioxide. If the water is free from carbon dioxide, then the ionisation of the sodium hydroxide is diminished by the addition of sodium chloride and, as theory requires, the alkalinity is decreased. Starke's result is explained by some of the dissolved carbon dioxide being expelled by the sodium chloride ; the water before solution of the chloride had, therefore, a stronger acid reaction, and this was so predominant as to exceed the decrease of ionisation of the alkali caused by the sodium chloride. Starke's observation that sodium chloride cannot be precipitated by sodium hydroxide has been experimentally disproved.

J. McC.

Demonstration of the Action of Normal Salts on Solutions containing Hydroxyl Ions. By G. DOYER VAN CLEEFF (*Rec. Trav. Chim.*, 1901, 20, 198—205).—Ammonium salts added to solutions containing hydroxyl ions diminish the concentration of these by the formation of ammonium hydroxide which is only slightly dissociated. This is shown by various reactions with indicators. Ammonium salts convert manganates and chromates into permanganates and dichromates in dilute solutions. Manganese borate, magnesium hydr-

oxide, and litharge are more soluble in ammonium salt solutions than in pure water.

That the addition of potassium or sodium chloride also diminishes the concentration of hydroxyl ions is shown (1) by solutions of potassium silicate to which these salts have been added becoming opalescent whilst pure aqueous solutions remain clear; (2) by the conversion of manganate in slightly alkaline solution into permanganate, and (3) by some reactions with indicators.

Hydroxylamine hydroxide being little dissociated in solution, the addition of its hydrochloride also causes a diminution of the concentration of the hydroxyl ions, as may be proved by its turning colourless a lightly alkaline solution containing phenolphthalein.

J. McC.

Action of Solar Radiations on Silver Chloride in the Presence of Hydrogen. By JOUNIAUX (*Compt. rend.*, 1901, 132, 1558—1560. Compare Abstr., 1900, ii, 139).—When silver chloride surrounded by an atmosphere of hydrogen is exposed to the action of the sun's rays, the chloride is reduced and hydrogen chloride is produced. When suitable amounts of the silver salt are employed and the exposure is continued for 18 months, practically the whole of the hydrogen is transformed into hydrogen chloride; the velocity of reaction depends, however, very largely on the state of aggregation of the solid reagent. At the ordinary temperature, this mixture of silver salt and hydrogen is in stable equilibrium as long as it is kept in the dark, as under these conditions the reaction only sets in at about 250°.

G. T. M.

Formation of Oceanic Salt Deposits, particularly of the Stassfurt Beds. XXII. Gypsum and Anhydrite. II. The Soluble Anhydrite (CaSO_4). By JACOBUS H. VAN'T HOFF, WILLY HINRICHSSEN, and FRITZ WEIGERT (*Sitzungsber. K. Preuss. Akad. Wiss.*, 1901, 570—578. Compare van't Hoff and Armstrong, Abstr., 1900, ii, 531).—By dehydration of gypsum at low temperatures, an anhydrous calcium sulphate is obtained which is fairly easily soluble and sets with great rapidity; thus there are two modifications of anhydrite. The temperature of transformation of gypsum into anhydrite is, contrary to what might be expected, below 107° (*loc. cit.*). This has been confirmed by a number of comparative vapour tension determinations, and a formula is deduced for the vapour tension of the system gypsum-anhydrite, showing its variation with the temperature. A small extrapolation of this formula gives 89° as the temperature of transformation of gypsum into anhydrite. At that temperature, therefore, the hydrate $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$, is metastable.

J. C. P.

Simultaneous presence of Barium and Sulphates in Mineral Waters. By P. CARLES (*J. Pharm.*, [vi], 13, 562—565).—In order to account for the simultaneous presence of barium and alkali sulphates in the mineral water of Nérès-les-Bains, the following experiment was made. A specimen of the barytes of the district (containing silicofluoride) was boiled with twice its weight of sodium carbonate until partly converted into barium carbonate. The still alkaline paste was

then supersaturated with carbon dioxide under pressure and filtered after 12 hours. The perfectly clear filtrate, which contained sodium sulphate, deposited barium carbonate (together with strontium and calcium carbonates) when the excess of carbon dioxide was expelled by heating. It is therefore evident that alkali hydrogen carbonates in presence of an excess of carbon dioxide, are capable of holding barium hydrogen carbonate in solution in the presence of soluble sulphates. The presence of lead in the same mineral water is most likely capable of a similar explanation.

M. J. S.

Barium Nitrite. By KURT ARNDT (*Zeit. anorg. Chem.*, 1901, 27, 341—358).—A pure barium nitrite cannot be prepared from the commercial product which contains nitrate, as it is impossible to separate the nitrite and nitrate either by crystallisation from water or alcohol, or by fractional precipitation of the aqueous solution with alcohol. The usual methods of formation, namely, by heating barium nitrate, by saturating barium hydroxide with nitrous acid, and by reducing the nitrate with lead sponge, also yield an impure nitrite which cannot be purified. The pure nitrite is obtained by shaking silver nitrite, mixed with washed sand and water, with barium chloride and evaporating the filtrate on the water-bath. When the aqueous solution is crystallised at the ordinary temperature over sulphuric acid, it has the composition $\text{Ba}(\text{NO}_2)_2 \cdot \text{H}_2\text{O}$; when crystallised at a higher temperature, it contains rather less water. It is soluble in its own weight of water, gives a colourless solution which is neutral to litmus, and when dried is slightly decomposed with the formation of barium hydroxide. It melts at about 220° . Even after prolonged ignition, decomposition is not complete, the mass still containing a small quantity of nitrite.

E. C. R.

Cadmium Amalgams. By HENDRIK W. BAKHUIS ROOZEBOOM [and BYL] (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 4, 1—5).—None of the liquid amalgams of cadmium solidifies completely at a constant temperature. Amalgams containing less than 67 per cent. of cadmium solidify to homogeneous mixed crystals of the mercury type, and those containing more than 77 per cent. solidify to homogeneous mixed crystals of the cadmium type. It is shown that for the Weston cell to have a constant *E.M.F.* it is necessary for the amalgam forming the negative pole to contain rather more than 70 per cent. of cadmium.

R. H. P.

Thallium Chlorobromides. By VICTOR THOMAS (*Compt. rend.*, 1901, 132, 1487—1489. Compare this vol., ii, 60, 100, 159).—Bromine reacting with thallous chloride in the presence of neutral solvents, chloroform, or carbon tetrachloride, yields the chlorobromide, $\text{Tl}_3\text{Cl}_2\text{Br}_4$. When the solvent is capable of combining with the halogens, the chloride is transformed into the dibromide, TlBr_2 ; this transformation is complete when sufficient excess of bromine is employed dissolved in carbon disulphide. The additive product, TlClBr , is produced when bromine vapour is passed over thallous chloride, a similar result being obtained on gently heating the reagents in sealed tubes.

G. T. M.

Results of Chilling Copper-Tin Alloys. By CHARLES T. HEYCOCK and FRANCIS H. NEVILLE (*Proc. Roy. Soc.*, 1901, 68, 171—178).—The results of a microscopical study of copper-tin alloys, and a discussion of the light thus thrown on the changes which take place when the alloys cool. The cooling curve for an alloy with 19 atomic per cents. of tin was first obtained, and the points determined at which development of heat took place. On the basis of this curve, certain temperatures were selected at which the cooling alloy was suddenly chilled by immersion in water. In order to bring out the pattern, the chilled alloys, after being ground and polished, were slightly heated until the film of oxide formed was of a pale yellow colour. It seems that for alloys richer in copper than Cu_3Sn , the parts which oxidise most rapidly and are therefore darkest in the yellow stage are the softer parts containing most copper. It is hardly possible to describe the observations made without the aid of the accompanying photographs. The authors find that the patterns of slowly-cooled copper-tin alloys are, until they have been confirmed by the examination of chilled portions, entirely misleading as to the separations which occur during solidification. The evidence for the existence of the compound Cu_3Sn will have to be revised.

J. C. P.

Commercial Copper Oxide. By PAUL DRAWE (*Zeit. angew. Chem.*, 1901, 14, 586—587).—Commercial copper oxide as used in glass factories often contains appreciable amounts of cuprous oxide, which interferes with the development of the required colour. The percentages of cuprous and cupric oxides present are determined by treatment with dilute sulphuric acid; the metallic copper which is deposited is removed, heated in a stream of hydrogen, and then dissolved in nitric acid, and the copper estimated by any of the ordinary methods. The copper sulphate in the filtrate from the finely divided metal is estimated by the aid of potassium thiocyanate.

J. J. S.

Action of a Metallic Hydroxide on Solutions of Salts of other Metals; Basic Salts of Two Metals. By ALBERT RECOURA (*Compt. rend.*, 1901, 132, 1414—1416).—The author has investigated the action of freshly prepared cupric hydroxide on solutions of certain metallic sulphates at the ordinary temperature and when hot, and has obtained the following products:

Zinc sulphate, when hot, a pale bluish-green compound, $\text{ZnSO}_4 \cdot 3\text{CuO}$; when cold, a pale blue compound, $7\text{ZnSO}_4 \cdot 24\text{CuO}$.

Cadmium sulphate, when hot, a pale blue compound, $\text{CdSO}_4 \cdot 3\text{CuO}$; when cold, a bright blue compound, $6\text{CdSO}_4 \cdot 20\text{CuO}$.

Manganous sulphate, when hot, a grey-green compound, $\text{MnSO}_4 \cdot 3\text{CuO}$; when cold, a green compound, $\text{MnSO}_4 \cdot 24\text{CuO}$.

Cobalt sulphate, when hot, a pale greenish compound, $\text{CoSO}_4 \cdot 3\text{CuO}$; when cold, a blue compound, $\text{CoSO}_4 \cdot 24\text{CuO}$.

Nickel sulphate, when hot, a pale greenish-blue compound, $5\text{NiSO}_4 \cdot 16\text{CuO}$; when cold, a bright blue compound, $\text{NiSO}_4 \cdot 20\text{CuO}$.

Cupric sulphate, whether hot or cold, a pale green compound, $\text{CuSO}_4 \cdot 3\text{CuO}$.

Except in the case of nickel, the products formed in the hot solutions are all of the same type, but those formed at the ordinary temperature vary considerably in type. C. H. B.

Action of a Metallic Oxide or Hydroxide on Solutions of Salts of other Metallic Radicles. By PAUL SABATIER (*Compt. rend.*, 1901, 132, 1533—1540. Compare preceding abstract).—The author calls attention to his previous communications on this subject, and classifies the different modes of action between the metallic oxides or hydroxides and the salts of other metals dissolved in water (compare Abstr., 1897, ii, 26, 491, 553; 1899, ii, 654). G. T. M.

Action of Mercuric Oxide on Aqueous Solutions of Metallic Salts. By A. MAILHE (*Compt. rend.*, 1901, 132, 1560—1563. Compare Sabatier, preceding abstract).—With manganous chloride solution, recently precipitated mercuric oxide yields a precipitate of manganous hydroxide, which rapidly darkens owing to oxidation, the final product being a mixture of manganese oxychloride and manganic oxide. Mercuric oxide has no action on the sulphate, even after several months; with the nitrate, it yields white, crystalline, hexagonal prisms having the composition $\text{Hg}(\text{NO}_3)_2 \cdot \text{MnO}_3 \cdot 3\text{H}_2\text{O}$; both varieties of mercuric oxide produce this result. The cadmium salts react similarly with mercuric oxide, the chloride giving an insoluble oxy-salt, $\text{CdCl}_2 \cdot \text{CdO} \cdot 7\text{H}_2\text{O}$, the nitrate yielding a crystalline basic double nitrate, $\text{Hg}(\text{NO}_3)_2 \cdot \text{CdO} \cdot 3\text{H}_2\text{O}$, whilst the sulphate remains unchanged. Lead chloride and mercuric oxide interact, forming the basic chloride, $\text{HgCl}_2 \cdot 2\text{PbO} \cdot 2\text{H}_2\text{O}$; lead nitrate, however, is not affected by the oxide.

When mercuric oxide is added rapidly to a solution of ferrous chloride from which the air is excluded, a brown precipitate is formed consisting of a mixture of mercurous chloride and basic ferric chloride; when the addition is carried out more slowly, the deposit consists entirely of the mercurous salt. The final result of the action of the oxide on a solution of ferrous sulphate is a yellow precipitate, consisting of a mixture of metallic mercury, mercurous sulphate, and basic ferric sulphate. Addition of mercuric oxide to ferric chloride solution yields an insoluble basic ferric chloride; in the case of the sulphate, a yellow powder is thrown down, having the composition of turpeth mineral; the nitrate yields the basic salt, $\text{Hg}(\text{NO}_3)_2 \cdot \text{HgO} \cdot \text{H}_2\text{O}$. G. T. M.

Basic Salts containing several Metallic Oxides. By GUSTAVE ANDRÉ (*Compt. rend.*, 1901, 132, 1563. Compare preceding abstract).—In consequence of the communications on basic double salts recently put forward by Mailhe and Recoura, the author calls attention to his earlier researches on analogous compounds (Abstr., 1887, 446, 447; 1888, 651). G. T. M.

Modifications of Mercuric Iodide. By D. DOBROSERDOFF (*J. Russ. Phys. Chem. Soc.*, 1901, 33, 384—387).—The temperature at which red mercuric iodide is converted into the yellow modification has been found by Gernez (Abstr., 1900, ii, 141) to be 126° . It is, however, observed that the yellow variety sometimes remains for a long time at the ordinary temperature without change, whilst the red form keeps its colour at temperatures at which transformation is possible. The

colour of solutions of mercuric iodide in organic solvents is yellow, and the yellow form is also deposited from these solutions, the colour only changing to red after some time. It would hence appear that in solution the iodide exists in the same form as it does in the state of vapour, namely, the yellow orthorhombic modification, and that the transformation temperature is considerably lowered by solvents. When potassium iodide and a mercuric salt are mixed in solution, the precipitate is at first yellow, and it is hence probable that when a double salt of mercuric iodide is decomposed by water, the yellow variety is first precipitated but is converted into the red form so rapidly as to escape observation. On cooling red mercuric iodide by means of solid carbon dioxide, a gradual but complete transformation into the yellow modification takes place. The reason of this change is not clear, since the transformation of the yellow into the red variety of the iodide is accompanied by a development of 3.0 Cal. T. H. P.

Double Salts of Mercuric Iodide with the Iodides of Nickel and Cobalt. By D. DOBROSERDOFF (*J. Russ. Phys. Chem. Soc.*, 1901, 33, 303—309).—The compound, $\text{NiI}_2 \cdot 2\text{HgI}_2 \cdot 6\text{H}_2\text{O}$, is obtained in the form of dirty green, prismatic, hygroscopic prisms, which are decomposed, by water or by grinding, into dirty grayish-green, drusy, crystalline masses having the composition $\text{NiI}_2 \cdot \text{HgI}_2 \cdot 6\text{H}_2\text{O}$; the latter salt, which is soluble in alcohol, ether, or acetone, is not decomposed by water, and on warming mercuric iodide is evolved.

The salt $\text{CoI}_2 \cdot 2\text{HgI}_2 \cdot 6\text{H}_2\text{O}$, has also been prepared, and forms dirty red, regular octahedra, which are soluble in alcohol or acetone, and are decomposed by the action of water or by grinding, yielding crystals of the composition $\text{CoI}_2 \cdot \text{HgI}_2 \cdot 6\text{H}_2\text{O}$, which are not attacked by water.

T. H. P.

Types of Double Salts of Mercuric Iodide with Iodides of Metals of different Valencies. By D. DOBROSERDOFF (*J. Russ. Phys. Chem. Soc.*, 1901, 33, 387—392).—All the double salts of mercuric iodide, with other metallic iodides investigated up to the present, may be regarded as derived from one or other of the acids having the formulæ HHgI_3 and H_2HgI_4 . The salts of the former acid are decomposed by water, half of the mercuric iodide they contain being precipitated, and the corresponding salt of the acid H_2HgI_4 formed (compare preceding abstract). It has also been found that hot concentrated hydriodic acid dissolves mercuric iodide, giving a solution of the composition HHgI_3 , and this, when sufficiently diluted with water, deposits HgI_2 , leaving in solution the acid H_2HgI_4 ; the compound HHgI_3 , which separates from solution in yellow needles, also decomposes in this way on standing in the air. No compounds of mercuric iodide with iodides of trivalent metals are as yet known. T. H. P.

Double Nitrates of Quadrivalent Cerium and of Thorium. By RICHARD JOS. MEYER and RICHARD JACOBY (*Zeit. anorg. Chem.*, 1901, 27, 359—389. Compare Abstr., 1900, ii, 597).—Basic ceric nitrate, $\text{Ce}(\text{NO}_3)_3 \cdot \text{OH} \cdot 3\text{H}_2\text{O}$, crystallises from solutions containing calcium nitrate in beautiful, red needles; when dissolved in water, it yields an acid, yellow solution, which gradually undergoes hydrolysis

and becomes almost colourless, the colour being regenerated on the addition of nitric acid; this hydrolysis takes place quickly when the solution is heated. A freshly prepared solution of the salt is at once reduced by hydrogen peroxide with evolution of oxygen, but a hydrolysed solution is at first coloured dark red owing to the formation of higher oxidation products, and then is gradually reduced.

The double nitrates of the formula $R'_2\text{Ce}(\text{NO}_3)_6$ are well crystallised, red salts, similar in appearance to the dichromates; they are very hygroscopic, show the same phenomena as ceric nitrate in aqueous solution, and are best prepared in the presence of nitric acid. The following salts are described. The ammonium salt, $(\text{NH}_4)_2\text{Ce}(\text{NO}_3)_6$, crystallises in the monoclinic system [$a:b:c=2.4668:1:2.3901$; $\beta=129^\circ 52'$]. The *potassium*, *rubidium*, and *cæsium* salts are also described, and crystallise without water. The *magnesium*, *zinc*, *nickel*, *cobalt*, and *manganese* salts crystallise with $8\text{H}_2\text{O}$, are very easily oxidised, must be prepared in the presence of strong nitric acid, crystallise in dark red or brown crystals, are decomposed when dissolved in water, and do not lose their water of crystallisation when dried over sulphuric acid.

Double nitrates of thorium nitrate. The *potassium* salt, $\text{K}_2\text{Th}(\text{NO}_3)_6$, crystallises from solution in dilute nitric acid at 80° in long prisms, and is hygroscopic. The salt $\text{KTh}(\text{NO}_3)_5 \cdot 9\text{H}_2\text{O}$ crystallises from neutral or faintly acid solutions when evaporated over sulphuric acid or potassium hydroxide, in thin, lustrous leaflets, is hygroscopic, and effloresces in the desiccator. The salt $\text{H}_3\text{K}_3\text{Th}(\text{NO}_3)_{10} \cdot 4\text{H}_2\text{O}$ crystallises from nitric acid of sp. gr. above 1.2 on evaporation over sulphuric acid and potassium hydroxide in large, transparent crystals, rapidly effloresces on exposure to air, and gives off all the free nitric acid and water when warmed. The *sodium* salt, $\text{NaTh}(\text{NO}_3)_5 \cdot 9\text{H}_2\text{O}$, resembles the potassium salt. The *ammonium* salt, $\text{NH}_4\text{Th}(\text{NO}_3)_5 \cdot 5\text{H}_2\text{O}$, is obtained from solutions of nitric acid up to sp. gr. 1.25; the salt, $(\text{NH}_4)_2\text{Th}(\text{NO}_3)_6$, from solutions in stronger acid. The isomorphous mixture, $(\text{K},\text{NH}_4)_2\text{Th}(\text{NO}_3)_6$, is obtained by adding ammonium nitrate to a solution of the salt $\text{H}_3\text{K}_3(\text{NO}_3)_{10} \cdot 4\text{H}_2\text{O}$. The *rubidium* salt, $\text{Rb}_2\text{Th}(\text{NO}_3)_6$, and the *cæsium* salt, $\text{Cs}_2\text{Th}(\text{NO}_3)_6$, are also described. The *magnesium* salt, $\text{MgTh}(\text{NO}_3)_6 \cdot 8\text{H}_2\text{O}$, forms colourless, monoclinic crystals [$a:b:c=1.0251:1:0.8640$; $\beta=119^\circ 1'$], is very hygroscopic, effloresces in the desiccator, and is decomposed when heated with evolution of water and nitric acid. The *zinc* salt, with $8\text{H}_2\text{O}$, is monoclinic [$a:b=1.0437:1$; $\beta=118^\circ 36'$]. The *nickel*, *cobalt*, and *manganese* salts crystallise with $8\text{H}_2\text{O}$.
E. C. R.

Europium, a new Element. By EUGÈNE DEMARÇAY (*Compt. rend.*, 1901, 132, 1484—1486. Compare *Abstr.*, 1900, ii, 481).—The oxide of the new element *europium*, ($\text{Eu}=151$ approx.), has been obtained so pure that it does not give any indication of the samarium spectra, and exhibits only faint traces of the strongest of the gadolinium lines. The anomalous ray referred by Crookes to the meta-element, S_8 , of the samarium group seems to be the most characteristic line of the new element's fluorescent spectrum, whilst the reversion spectrum exhibits the line Z_ζ of Lecoq de Boisbaudran.

Traces of the new oxide, mixed with calcium sulphate and rendered fluorescent in the vacuum tube, yield a brilliant spectrum, the wavelengths of lines of which have been measured and tabulated. The reversion and absorption spectra have already been described.

G. T. M.

Aluminium and Magnesium Alloys. By OCTAVE BOUDOUARD (*Compt. rend.*, 1901, 132, 1325—1327).—The determination of the melting points of mixtures of aluminium and magnesium effected by means of Le Chatelier's thermo-electric couple shows that there are two points of maximum (455° and 462°) and three of minimum solubility (356°, 445°, and 432°) in mixtures containing from 10 to 20 per cent. of aluminium. The two maxima indicate the existence of two compounds, AlMg_2 and AlMg . Starting from pure aluminium and gradually adding magnesium, it is found that the fragility of the mixture increases continuously, reaching a maximum when the metals are in equal proportions; this alloy is so friable that it may be broken between the fingers and pulverised in a porcelain mortar. As the amount of magnesium increases from this point onwards, the fragility diminishes.

G. T. M.

Aluminium Alloys. Compounds of Aluminium and Molybdenum. By LÉON GUILLET (*Compt. rend.*, 1901, 132, 1322—1325).—The author employs the method already indicated (this vol., ii, 388) in preparing alloys of aluminium and molybdenum. The alloy Al_4Mo forms lamellar crystals, and is formed together with AlMo , which separates in fibrous needles. The substance Al_7Mo is also obtained in crystalline aggregates. These crystals are all decomposed by concentrated acids, but are not attacked by boiling water. The dross which accompanies these crystalline products when treated with aqua regia yields well-defined crystals varying in composition. These substances are being investigated.

G. T. M.

Manganese Compounds. II. Manganic Acetate and Manganese Alums. By ODIN T. CHRISTENSEN (*Zeit. anorg. Chem.*, 1901, 27, 321—340; *Abstr.*, 1900, ii, 596).—Hydrated manganese peroxide is easily obtained by the action of potassium permanganate on a warm solution of manganous acetate. Hydrated manganomanganic oxide is prepared by triturating the hydrated peroxide with a warm solution of manganous chloride mixed with ammonium chloride and an excess of ammonia.

Manganic acetate is obtained by treating undried, hydrated manganomanganic oxide with acetic acid at the ordinary temperature, or by the action of potassium permanganate on manganous acetate in the presence of acetic acid. It can be recrystallised from warm acetic acid, and when treated with oxalic acid in the presence of potassium acetate gives a beautiful, red coloration which is due to the formation of a potassium manganic oxalate.

From manganic acetate, the manganese alums are easily prepared by dissolving it in sulphuric acid and then adding the alkali sulphate also dissolved in sulphuric acid, but it is necessary to cool the solution at -2 — 5° or better at -20 — 25° . Cæsium, rubidium, potassium, and ammonium manganese alums are described. They are very unstable;

the potassium and ammonium salts decompose at the ordinary temperature, and the caesium salt, which is the most stable, at 40°. The potassium and ammonium alums cannot, therefore, be obtained by Mitscherlich's method, which yields only a double sulphate of ammonium and manganese containing less than 24H₂O. E. C. R.

New Method of preparing Ferrous Oxide. By JULES FÉRÉE (*Bull. Soc. Chim.*, 1901, [iii], 25, 615—617).—It is generally stated that an amalgam of iron is unstable, and easily decomposes into mercury and iron; this is not correct, for the decomposition depends on the conversion of the iron into ferrous oxide and does not take place in a vacuum or in an atmosphere of an inert gas. The oxide formed was analysed, and an experiment is also described in which the increase in weight of a piece of amalgam containing 35·72 per cent. of iron was found in six days to correspond with the oxidation of 96·54 per cent. of the iron; the oxide takes fire at about 350° and burns to magnetic oxide. T. M. L.

Cobalt Sulphide. By W. HERZ (*Zeit. anorg. Chem.*, 1901, 27, 390—392).—Cobalt sulphide, prepared by precipitating a solution of cobalt nitrate with ammonium sulphide and washing by decantation with water, is, when freshly prepared, soluble in dilute hydrochloric acid (*N*/2) with evolution of hydrogen sulphide. When allowed to remain exposed to the air, it is partially converted into sulphate, and when treated with dilute hydrochloric acid is partially soluble without any evolution of hydrogen sulphide; the remainder of the sulphide has, however, apparently polymerised, and is now insoluble. E. C. R.

Electrolytic Chromium. By JULES FÉRÉE (*Bull. Soc. Chim.*, 1901, [iii], 25, 617—618).—Metallic chromium is readily deposited in a steel-grey form on a platinum cathode from a solution of crystalline chromic chloride acidified with hydrogen chloride, or in a silver-white form by electrolysis of a solution containing chromium and potassium chlorides in the proportion CrCl₃:3KCl; the current density was 0·15 ampere per sq. cm., and the pressure 8 volts. The metal is not attacked by concentrated sulphuric acid, nitric acid, or potassium hydroxide.

T. M. L.

A new Oxide of Chromium, CrO. By JULES FÉRÉE (*Bull. Soc. Chim.*, 1901, [iii], 25, 619—620).—The oxide CrO is obtained as a black powder by the oxidation of chromium amalgam exposed to air. It has a constant composition, and when dissolved in hydrogen chloride liberates an amount of hydrogen corresponding with the equation $3\text{CrO} + 8\text{HCl} = \text{CrCl}_2 + 2\text{CrCl}_3 + 3\text{H}_2\text{O} + \text{H}_2$; when struck with a pestle or when heated in air, it inflames and burns to the green oxide; it is not changed by heating in a vacuum; it is insoluble in nitric acid or dilute sulphuric acid, but dissolves in hydrochloric acid to a blue solution, which becomes green on the addition of nitric acid.

T. M. L.

A new Hydrate of Chromium Sesquioxide, Cr₂O₃.H₂O. By JULES FÉRÉE (*Bull. Soc. Chim.*, 1901, [iii], 25, 620—622).—By the electrolysis of neutral solutions of chromic chloride, a brown substance

is produced, which Bunsen (*Ann. Phys. Chem.*, 1854, **91**, 619) regarded as having the formulæ Cr_4O_5 or Cr_5O_6 ; experiments are now described to show that this is a hydrate, $\text{Cr}_2\text{O}_3 \cdot \text{H}_2\text{O}$; when heated in air or in a vacuum, it glows at about 400° , gives off water, and is converted into the green oxide.

T. M. L.

Chromium Nitride. By JULES FÉRÉE (*Bull. Soc. Chim.*, 1901, [iii], 25, 618).—Chromium nitride, CrN (Briegleb and Geuther, *Annalen*, 1862, 123, 239), can be prepared in a pure state by heating pyrophoric chromium, obtained by distilling an amalgam at a temperature below 350° , in a current of nitrogen or ammonia gas; it is insoluble in hydrochloric acid, nitric acid, and aqua regia.

T. M. L.

New Hydrate of Normal Sodium Chromate. By HEINRICH SALKOWSKI (*Ber.*, 1901, **34**, 1947—1950).—The salt $\text{Na}_2\text{CrO}_4 \cdot 6\text{H}_2\text{O}$ was obtained accidentally from the mother liquors of a solution out of which the salt $\text{Na}_2\text{CrO}_4 \cdot 4\text{H}_2\text{O}$ had been crystallised. It crystallised in triclinic plates and further crops were obtained by seeding saturated solutions of sodium chromate with it. The solubilities of the salt between 17° and 27° are plotted, and compared with the solubilities of the tetra- and deca-hydrates.

R. H. P.

Uranium Amalgam and Pyrophoric Uranium. By JULES FÉRÉE (*Bull. Soc. Chim.*, 1901, [iii], 25, 622—623).—Uranium amalgam is very readily oxidised, but can be prepared by electrolysing uranous chloride in a divided cell; on distilling off the mercury at 241 — 242° , a residue of metallic uranium is left, which inflames spontaneously in the air.

T. M. L.

Cæsium-Antimonious Fluorides and other Double Haloids of Antimony. By HORACE L. WELLS and F. J. METZGER (*Amer. J. Sci.*, 1901, [iv], 11, 451—456).—Several double fluorides of cæsium and antimony were obtained by mixing varying proportions of solutions of cæsium fluoride and antimony fluoride, prepared by treating the respective carbonate and oxide with hydrofluoric acid. The salt $\text{CsF} \cdot 2\text{SbF}_3$ crystallises in beautiful, transparent needles, the salt $\text{CsF} \cdot 3\text{SbF}_3$ in stout, transparent prisms, and the salt $4\text{CsF} \cdot 7\text{SbF}_3$ (?), in transparent plates; the salt $\text{CsF} \cdot \text{SbF}_3$ obtained when the cæsium fluoride is in excess, crystallises in square prisms, and the salt $2\text{CsF} \cdot \text{SbF}_3$ obtained when a large excess of cæsium fluoride is present, in rhombic prisms. The *cæsium antimonious iodide*, $3\text{CsI} \cdot 2\text{SbI}_3$, occurs in two modifications, one of which is brick-red in colour and apparently octahedral in form, whilst the other is yellow and occurs in thin, hexagonal plates. An indefinite *cæsium antimonie fluoride*, $\text{CsF} \cdot \text{SbF}_4 \cdot \text{OH}$, is also described, and crystallises in bundles of transparent needles.

R. H. P.

Gold and Silver Alloys and other materials obtained from Egyptian Tombs. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1901, **132**, 1282—1286. Compare this vol., ii, 25).—This communication contains a further account of the analytical researches made on gold and silver alloys and other antique objects taken from Egyptian tombs of various epochs. The data obtained are, however, not suffi-

cient to permit of generalisations being made connecting the composition of the alloys with the date of their manufacture. G. T. M.

Metals of Ancient Egypt: Study of a Metallic Sheath and its Inscriptions. By MARCELLIN P. E. BERTHELOT (*Ann. Chim. Phys.*, 1901, [vii], 23, 5—32).—This communication is chiefly of archæological interest: the presence of an alloy containing platinum, iridium, and gold amongst the materials forming the sheath has been previously indicated (compare this vol., ii, 318). G. T. M.

Mineralogical Chemistry.

Gold and Silver Tellurides from the Kalgoorlie District (Western Australia). By ADOLPHE CARNOT (*Compt. rend.*, 1901, 132, 1298—1302).—Analyses of samples of tellurides taken from the Lake View Consols and Great Boulder Proprietary mines, show that the following mineral species are present: Sylvanite, $(\text{Au}, \text{Ag})\text{Te}_2$, calaverite, corresponding with the preceding substance but less crystalline, and containing a smaller proportion of silver, kalgoorlite, $(\text{Au}, \text{Ag}, \text{Hg})_2\text{Te}$, and a new sesquite lluride, *coolgardite*, $(\text{Au}, \text{Ag}, \text{Hg})_2\text{Te}_3$, containing very variable proportions of gold and silver, the metals replacing each other isomorphously. These minerals also contain small quantities of copper, nickel, iron, and antimony, and their percentage compositions are tabulated. G. T. M.

Mohawkite. By JOSEPH W. RICHARDS (*Amer. J. Sci.*, 1901, [iv], 11, 457—458).—Koenig has recently given the name mohawkite to a nickeliferous and cobaltiferous variety of domeykite, $(\text{Cu}, \text{Ni}, \text{Co})_3\text{As}$, from the Mohawk mine, Michigan (this vol., ii, 108). The same name had, however, been previously used by Ledoux (*Eng. Min. J.*, 1900, 69, 414), for a similar [probably the same] mineral from the same mine to which he gave the formula Cu_4As . The latter formula was doubted by Koenig, but is confirmed by the present author, who proposes the name *ledouxite* for a mineral having this composition. The results of his analysis are:

Cu.	Co.	Ni.	Fe.	As.	Total.	Sp. gr.
70·8	6·4	trace	0·0	[22·8]	100·0	8·07

L. J. S.

Microlite from Finland. By ADOLF ERIK NORDENSKIÖLD (*Jahrb. Min.*, 1901, i, Ref. 352; from *Geol. För. Förh.*, 1899, 21, 639).—Indistinct crystals of ixiolite and skogbölite from Skogböle, Kimito, Finland, are coated with a yellowish-brown, crystalline layer, 0·5 mm. thick, of microlite. Analysis of this gave:

Ta_2O_5 .	SnO_2 .	CaO .	FeO .	Ce_2O_3 .	Loss on ignition.	Total.	Sp. gr.
72·16	1·96	14·23	4·79	0·14	0·11	93·39	5·65

The deficiency of 6.61 per cent. probably represents alkalis and fluorine.

L. J. S.

Calcareous Concretions of Kettle Point, Ontario. By REGINALD A. DALY (*J. Geol.*, 1900, 8, 135—150).—A description is given of the large spherical concretions which occur in bituminous shale at Kettle Point, at the southern end of Lake Huron. They consist of radially crystallised calcium carbonate, and show also a concentric structure. Analysis of a darker brown ball gave: CaCO_3 , 88.42; MgCO_3 , 2.99; Fe_2O_3 , 0.71; insol. in hydrochloric acid (SiO_2), 4.25; hydrocarbons and water, 3.23 = 99.60. The mode of origin of the concretions is discussed, and the local deformation of the shale around the balls is attributed to the change in volume when the material was deposited from solution.

L. J. S.

Natural History of Marl. By CHARLES A. DAVIS (*J. Geol.*, 1900, 8, 485—497).—Aquatic plants are frequently encrusted with mineral matter, especially calcium carbonate. The absorption of carbon dioxide and the liberation of oxygen by the plant causes the deposition of calcium carbonate from a solution of calcium hydrogen carbonate. A sample of *chara* dried at 100° gave on analysis: CaCO_3 , 76.00; MgCO_3 , 2.359; Fe_2O_3 , Al_2O_3 , 0.722; insoluble in hydrochloric acid, 11.19 (consisting of combustible and volatile matter, 9.243; silica, 1.787; undetermined, 0.160); soluble organic matter by difference, 9.279 per cent. On these grounds, it is suggested that many important deposits of marl may have been formed by the agency of aquatic plants and especially *chara*. In an accompanying paper (*ibid.*, 498—503) by the same author, a description is given of a small lake in Michigan where marl is now being deposited in this way.

L. J. S.

Alumina present in Mineral Waters. By F. PARMENTIER (*Compt. rend.*, 1901, 132, 1332—1333).—The majority of the mineral waters from central France (Vichy) contain notable quantities of alumina, although former analyses have not indicated the presence of this substance. When these waters lose their carbon dioxide, precipitates of crystallised calcium and magnesium carbonates are formed, and finally, when the gas has almost entirely disappeared, a deposit of alumina is produced containing variable quantities of ferric oxide. The addition of lime water to these waters produces a white turbidity which after a time partly disappears. This precipitate consists of calcium and magnesium carbonates mixed with alumina, the carbonates redissolve in the excess of carbonic acid present, whilst the alumina undergoes polymerisation, and gradually collects together as a deposit consisting of closely united filaments.

G. T. M.

Analysis of Red Rain Deposit, which fell in Victoria, Australia, December 26, 1896. By THOMAS L. PIMPSON (*Chem. News*, 1901, 83, 253).—The deposit consisted of exceedingly small grains of various colours, many being flat or tabular with irregular edges; it was very slightly, if at all, magnetic. When treated with hydrochloric acid, it neither effervesced nor evolved chlorine. Analysis yielded the following numbers per cent.: Water, 9.09;

organic matter, 5.21; soluble in hydrochloric acid, 8.00 (containing Fe_2O_3 , Al_2O_3 , SiO_2 , and TiO_2 , 4.61; CaO , MgO , Na_2O , K_2O , and traces of Ni and CO , 3.39). Insoluble in hydrochloric acid, 77.70 (containing SiO_2 , 50.99; Fe_2O_3 and Al_2O_3 , 16.40; CaO , 0.21; Na_2O , K_2O , and trace of Li_2O , 10.10). Before the blow-pipe and in composition the insoluble portion resembles felspar.

D. A. L.

Physiological Chemistry.

Respiration in Annelids. By BOUNHIOL (*Compt. rend.*, 1901, 132, 1348—1351).—The amount of carbon dioxide produced per unit of time by the aquatic worm *Spirographis*, was taken as a measure of its respiratory activity. Under constant conditions, this does not vary greatly in the same animals, but it can adapt itself to changes in their surroundings. With an equal weight of small and large animals, respiration is more active in the former; this is no doubt connected with a greater surface area. If the gills are removed, the amount of gas produced sinks by a quarter, but in a few hours returns to the normal. If the skin is vaselined, the amount of gas again falls, but returns to the normal some hours later. If the temperature of the water is raised within moderate limits, respiration is slightly more active. Light has no influence.

W. D. H.

Influence of Boric Acid and Borax on Metabolism in Children. By FRANCIS W. TUNNICLIFFE and OTTO ROSENHEIM (*J. Hyg.*, 1901, i, 186—201).—A series of experiments on children, which seek to show that boric acid and borax are practically harmless.

A. S. GRÜNBAUM (*Brit. Med. J.*, 1901, i, 1337) criticises Tunnicliffe and Rosenheim's work. The experiments are few, each lasted only 12 days, and the children selected are above the age when milk is the staple article of diet. The fact that the boric acid and borax are rapidly excreted by the kidneys is evidence of their poisonous character.

W. D. H.

Influence of Formaldehyde on the Metabolism of Children. By FRANCIS W. TUNNICLIFFE and OTTO ROSENHEIM (*J. Hyg.*, 1901, i, 321—366).—The experiments were made on children in a way similar to those previously recorded with borax (preceding abstract). The children were three in number, aged $2\frac{1}{2}$, 4, and 5 years respectively. The normal course of metabolism was compared with that occurring during a limited period (7 to 14 days) when small quantities of formaldehyde were added to the diet. The general health was not affected, but there is a diminution of phosphorus and fat assimilation. In one child who was weakly, the nitrogenous assimilation was also injuriously affected. There was no intestinal antiseptic action, and the bad effects of the drug are attributed to its effect on pancreatic digestion.

W. D. H

Influence of Lecithins in the Egg in Nutritive Exchanges. By ALEXANDRE DESGREZ and A. ZAKY (*Compt. rend.*, 1901, 132, 1512—1514).—The lecithins of the fowl's egg increase the appetite of animals which receive them either by the mouth or under the skin. These animals rapidly increase in weight. Urea, total urinary nitrogen, and the coefficient of utilisation of nitrogen are increased, but the phosphoric acid in the urine is diminished.

W. D. H.

[Dietary Studies.] By HARRY S. GRINDLEY, J. L. SAMMIS, E. F. LADD, ISABEL BEVIER, and ELIZABETH C. SPRAGUE (*U.S.A. Dept. Agric. Bull.*, 1900, 91, 1—42).—Statistics are given of the dietaries in certain public institutions for men and for women. Particular attention is paid to cost, nutritive value, and the amount of waste.

W. D. H.

The Fat-splitting Ferment of the Stomach. By FRANZ VOLHARD (*Chem. Centr.*, 1901, i, 1296—1297; from *Zeit. klin. Med.*, 42, 414—429).—The mucous membrane of the fundus of the stomach secretes a fat-splitting enzyme, which can be extracted with glycerol. It is weakened and eventually destroyed by pepsin-hydrochloric acid.

W. D. H.

Hippuric Acid Metabolism in Man. By CARL LEWIN (*Chem. Centr.*, 1901, i, 1297; from *Zeit. klin. Med.*, 42, 371—397).—A healthy man secretes daily from 0.1 to 0.3 gram of hippuric acid. This amount is increased by feeding on dextrose, by increase in intestinal putrefaction, or by administration of foods rich in nuclein, such as sweetbread, this being, however, attributed to the increase of putrefaction in the intestines, since nucleic acid does not produce the effect. In gout and diabetes, the amount is normal; in febrile conditions, in kidney disease, and in perityphlitis the amount of hippuric acid rises.

W. D. H.

Presence of Carbon Monoxide in the Blood. By MAURICE NICLOUX (*Compt. rend.*, 1901, 132, 1501—1504).—The presence of small amounts of carbon monoxide has been shown in the blood of anaesthetised animals, in the blood of normal dogs, and in the Paris atmosphere. It is now stated that this gas (0.11 c.c. in 100 c.c. of blood) occurs in the blood of animals just born. This observation appears to relate to human beings, but there is no clear statement on this point.

W. D. H.

Blood of Animals deprived of their Suprarenals. By ISAAC LEVIN (*Amer. J. Physiol.*, 1901, 5, 358—361. Compare this vol., ii, 256).—The results of the experiments show that the suprarenal gland not only forms an internal secretion, but is also excretory. It is strange that the blood of such animals and suprarenal extracts both raise the blood pressure; it may, however, be that the two materials are in other respects antagonistic.

W. D. H.

Presence and Localisation of Iodine in the Leucocytes of Normal Blood. By HENRI STASSANO and PAUL BOURCET (*Compt. rend.*, 1901, 132, 1587—1589. Compare Abstr., 1900, ii, 555).—An examination of blood drawn from a dog as rapidly as possible, and

either defibrinated or treated with sodium oxalate, shows that the iodine present is contained solely in the degradation products of the leucocytes. The red corpuscles, when completely freed from leucocytes, contain no trace of this element.

G. T. M.

Rhythmic Activity of the Œsophagus. By PERCY G. STILES (*Amer. J. Physiol.*, 1901, 5, 338—357).—The action of various salts, interpreted by the ionic theory, is described in connection with the rhythm of the isolated Œsophagus of the frog. Sodium is essential, but by itself sodium chloride is depressant. The simultaneous presence of calcium and potassium is also necessary; a stimulating rôle is assigned to calcium, and an inhibiting one to potassium.

W. D. H.

A new form of Muscular Irritability. By JACQUES LOEB (*Amer. J. Physiol.*, 1901, 5, 362—373).—Certain salt solutions (1 gram-mol. in 8 or 10 litres) bring about an apparently new form of irritability in muscles, which is termed 'contact irritability.' A muscle which has been treated in this way will contract powerfully when it passes from the salt solution to air, carbon dioxide, oil, sugar solution, &c., or from solutions of glycerol or sugar to air. The salts which act in this way are with one exception sodium salts, the anions of which are capable of precipitating calcium; they are sodium fluoride, carbonate, oxalate, citrate, tartrate, and disodium hydrogen phosphate. If the nerve alone is put into one of these solutions, the muscle begins to twitch and finally goes into tetanus; the contraction ceases when the nerve is removed from the solution. The salts or their ions do not directly stimulate the nerve, but only modify or increase its irritability, for when the same nerve is brought into contact with any solid or liquid body, the muscle resumes its contractions, whilst these gradually cease or diminish when the nerve is again surrounded with air. It is regarded as possible that alterations of motor and sensory reactions in neurotic patients may be due to ionic action.

W. D. H.

Rigor in Frog's Muscles. By N. M. STEVENS (*Amer. J. Physiol.*, 1901, 5, 374—386).—From experiments on the frog's gastrocnemus, the following conclusions are drawn: the energy of *rigor* contraction decreases rapidly with decrease of temperature, being very slight at or below 20°. The energy of secondary heat contractions at 50—63° is less than that of ordinary *rigor* contraction at 20°. A muscle undergoing heat *rigor* does more work when it contracts against a spring than when it is "after loaded" (200 grams). The fact that complete *rigor* at 20° entirely cuts out the first heat contraction at 37—45°, but not that at 50—63° indicates that *rigor mortis* involves coagulation of soluble myogen fibrin, but not of myosin or myogen. The fact that immersion of the muscle in chloretone solution (0.1 to 0.5 per cent.) produces a similar contraction, indicates that chloretone coagulates soluble myogen fibrin, but not the other proteids. A slight contraction produced by weak chloretone solution is compensated by a proportionately greater secondary heat contraction, as in the case of slight *rigor mortis* contractions (Brodie and Richardson). The action of chloretone is very definite and constant as compared with that of

potassium thiocyanate. The nomenclature of the muscle proteids is that introduced by von Fürth. W. D. H.

Origin of Iodine in the Organism. By PAUL BOURCET (*Compt. rend.*, 1901, 132, 1364—1366).—The amount of iodine in various foods was examined. Vegetable food is the main source of iodine in the animal body, and the greater part of this element is returned again by the excretions to complete the biological cycle.

W. D. H.

Osseo-mucoid. By P. B. HAWK and WILLIAM J. GIES (*Amer. J. Physiol.*, 1901, 5, 387—425. Compare this vol., ii, 298).—Lime water extracts from ossein, prepared from partly decalcified ribs and femora of the ox, a substance having the characters of mucin and chondromucoid: it is termed *osseo-mucoid*. This shows, contrary to Young's deduction, that in ossification the connective tissue matrix is not completely removed. Variations in percentage composition indicate the probability that two or more glucoproteids exist in bone. The four analyses showing the most concordant results give the following average percentages: C, 47.07; H, 6.69; N, 11.98; S, 2.41; O, 31.85. Phosphorus is absent. Between 1 and 1.6 per cent. of the sulphur may be split off as sulphuric acid on boiling with dilute hydrochloric acid. The energy liberated on oxidation of mucin substances is less than that for any form of proteid except fibroin.

W. D. H.

Absorption and Secretion. By MAX. OKER-BLOM (*Pflüger's Archiv*, 1901, 85, 543—575).—This is the fifth of a series of papers on the physico-chemical relationships of animal tissues and juices. The importance of osmotic pressure and kataphoresis in the phenomena of absorption and secretion is pointed out at considerable length and with experimental data.

W. D. H.

Bile of Polar Animals. I. Bile of the Polar Bear. By OLOF HANMARSTEN (*Zeit. physiol. Chem.*, 1901, 32, 435—466).—Specimens of bile from polar bears were collected on certain Arctic expeditions, and received in alcohol. Numerous analytical details are given. The principal pigment is a brownish-yellow one which does not give Gmelin's reaction or any spectroscopic bands; it was found also in gall stones from these animals. There are also small quantities of bilirubin and urobilin. Particular attention is drawn to the presence of an unknown organic substance, which is reducing and rich in sulphur, to the presence in large quantities of a lecithin-like material rich in phosphorus, to the absence of glycocholic acid, and to the relatively high percentage of sulphates in the ash.

W. D. H.

Composition of a Liquid obtained by Tapping. By F. MAL-MÉJAC (*J. Pharm.*, 1901, [vi], 13, 459—460).—A liquid (890 c.c.) obtained by tapping a patient in the tenth intercostal space gave the following results on analysis, in grams per litre. Sp. gr. 1.013; reaction distinctly alkaline. Sodium chloride, 6.6; phosphoric acid, 0.08; acetone, 0.206; urea, 2.5; total proteids, 25.432, of which 23.304 was serum-albumin. Urobilin was also present in large

amount; also a few pus globules. Alcohol, aldehyde, uric acid, globulin, peptones, sugar, bile, indican, and blood were absent. The liquid had no odour; its colour resembled that of coffee. M. J. S.

Use of Silicotungstic Acid as a Reagent for the Alkaloids in Urine; Variations in Alkaloidal Nitrogen. By H. GUILLE-MARD (*Compt. rend.*, 1901, 132, 1438—1440).—The alkaloids in urine are readily precipitated in the form of an amorphous, rose coloured powder, by silicotungstic acid in presence of hydrochloric acid after removal of proteids. The precipitate contains creatinine, xanthic bases, a yellow, amorphous, alkaloidal colouring matter, a non-crystallisable substance which seems to form the non-dialysable basic part of urine, and a volatile substance which has a strong odour of urine and forms a soluble crystallisable platinichloride. The nitrogen may be estimated before precipitation with the silicotungstic acid, and in the precipitate, and thus the ratio of alkaloidal nitrogen and total nitrogen is ascertained. The total amount and the relative amount of "alkaloidal nitrogen" eliminated in 24 hours by a normal subject varies considerably with the diet, and is highest with a flesh diet and lowest with a milk diet. In febrile diseases, even on a milk diet, there is a marked increase in the absolute and relative amounts of alkaloidal nitrogen eliminated. In Bright's disease, on the other hand, the figures are considerably below the normal, but can be brought back to normal by a milk diet. In diabetes, the figures are below normal, whilst in diseases of the nervous centres they are usually much above normal. In other chronic maladies, such as syphilis, chronic rheumatism, chlorosis, &c., there are no definite deviations from the normal. C. H. B.

Behaviour of Pentoses, especially *l*-Arabinose, in the Animal Body. By ERNST SALKOWSKI (*Zeit. physiol. Chem.*, 1901, 32, 393—412).—The experiments described chiefly relate to *l*-arabinose. This substance is well absorbed in rabbits, and about 18 per cent. of it passes unchanged into the urine. It causes, more or less, an accumulation of glycogen in the liver. There is, however, no ground for supposing that the glycogen is directly formed from the arabinose. Whether arabinose is carbohydrate-sparing, fat-sparing, or proteid-sparing is doubtful. After feeding on arabinose, the muscles contain a lævotatory substance, the nature of which was not made out.

W. D. H.

Behaviour of the three Arabinoses in the Animal Body. By CARL NEUBERG and JULIUS WOHLGEMUTH (*Ber.*, 1901, 34, 1745—1749).—The authors have followed the fate of the three arabinoses when given to rabbits which were being fed on a diet free from carbohydrate ("diabetes-milk"). The arabinose excreted in the urine was estimated as diphenylhydrazone (*Abstr.*, 1900, i, 539). After being fed in turn with each of the three arabinoses (5—10 grams), 14.5 per cent. of *l*-arabinose, 31.2 of *d*-arabinose, and 28.5 of *r*-arabinose respectively appeared in the urine. In the case of *r*-arabinose, some 5 per cent. of *d*-arabinose was also present in the urine with the inactive isomeride. Subcutaneous injection led to

similar results. Injection of the sugar into the auricular vein showed no such contrast between the excretion of the three isomerides in the urine. The *lævo*- is accordingly more readily attacked than the *dextro*-sugar; *r*-arabinose is partially decomposed into its components, of which more of the *dextro*-sugar escapes attack, and consequently appears, together with the *r*-arabinose, in the urine. Only from *l*-arabinose, and not from *d*- or *r*-arabinose, could the rabbits form glycogen. Feeding with the sodium salts of the three arabonic acids showed similar results. Attention is drawn to the fact that, physiologically, *l*-arabinose and dextrose are closely allied, whilst chemically dextrose and *d*-arabinose are more nearly related. K. J. P. O.

Physiological Action of Carone. By ENRICO RIMINI (*Atti Real. Accad. Lincei*, 1901, [v], 10, i, 435—441).—Experiments with frogs, mice, and guinea pigs show that the physiological action of carone is not very strongly marked, and is explained mainly by paralytic phenomena, first of the voluntary muscular movements, and afterwards of the respiration. The heart resists the action of carone when the latter reaches it by means of the circulation, but if the compound is placed in immediate contact with the cardiac muscle, an appreciable diminution takes place in the number of the contractions, until the final stoppage of the heart which occurs very soon, and is always in a condition of semi-diastole. The fact that carone is not capable of causing epileptic convulsions in mammals, and hence differs in its action from the saturated dicyclic ketones isomeric with camphor, is explained by the author as probably due to a transformation of carone in the organism, similar to that produced by dilute sulphuric acid, which converts it into oxytetrahydrocarvone. T. H. P.

Influence of Asphyxia on the Glycogenic function of the Liver. By JOSEF SEEGEN (*Chem. Centr.*, 1901, i, 1297; from *Centr. f. Physiol.*, 25, 65—69).—In normal animals, there is a *postmortem* increase in the sugar of the liver. In dogs and men killed by asphyxia, this does not occur; in such cases, the vitality of the liver cells is lessened. In such cases also, the amount of glycogen is very small. W. D. H.

Action of Iron in Anæmia experimentally produced. By FRANZ MÜLLER (*Virchow's Archiv*, 1901, 164, 436—492).—In cats, inorganic iron is for the most part absorbed into the blood stream. In dogs rendered anæmic by bleeding, it causes an increase of hæmoglobin. The iron given is used in the bone marrow for the making of the precursors of the blood pigment. It acts as a formative stimulus ("formativer": Reiz, Virchow). W. D. H.

Action of Strychnine on the Spinal Cord of Rabbits. By HOBART A. HARE (*Amer. J. Physiol.*, 1901, 5, 333—337).—In rabbits, strychnine does not chiefly affect the anterior part of the animal's body, as stated by some observers. The hind legs are affected very promptly, and the exhaustion paralysis here is very marked, whereas the fore limbs speedily regain their power. W. D. H.

Antidote for Cyanide Poisoning. By OTTO HERTING (*Zeit. angew. Chem.*, 1901, 585—586).—See this vol., ii, 534.

Chemistry of Vegetable Physiology and Agriculture.

Oligonitrophilous Microbes. By MARTINUS W. BEYERINCK (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 4, 5—9).—Experiments are described which show that various species of *Cyanophyceæ* will develop in culture liquids containing the mineral constituents of foods, but free from nitrogen compounds; these organisms assimilate nitrogen from the air, and their development is prevented by the presence of nitrogen compounds in the culture liquids.
R. H. P.

Photobacteria as a Reactive in the Investigation of the Chlorophyll Function. By MARTINUS W. BEYERINCK (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 4, 45—49).—Photobacteria can be used to show when the chlorophyll of leaves is functioning, for if leaves in contact with a culture of photobacteria are excluded from any source of oxygen, the bacteria will only phosphoresce when the chlorophyll is functioning.
R. H. P.

Biochemical differentiation of the two principal Vinegar Ferments. By GABRIEL BERTRAND and R. SAZERAC (*Compt. rend.*, 1901, 132, 1504—1507).—The two best known vinegar ferments, *Mycoderma aceti* and the sorbose bacterium (Brown's *Bacterium xylinum*), differ markedly in their behaviour towards glycerol solutions. A pure culture of the first of these, introduced into a sterilised nutritive solution of glycerol, has practically no action on the alcohol, and at the end of three months the solution fails to reduce Fehling's solution. On the other hand, a specimen of the second ferment placed in a similar solution rapidly transforms the glycerol into dihydroxyacetone, the amount of this ketone produced in 2—3 days being sufficient to precipitate an appreciable quantity of cuprous oxide on the addition of copper potassium tartrate.
G. T. M.

Yeast Trypsin. By FR. KUTSCHER (*Zeit. physiol. Chem.*, 1901, 32, 419—424).—The author contests Salkowski's claims to priority in the discovery of a tryptic enzyme in yeast (*Abstr.*, 1889, 1027).
J. J. S.

Rate of Nitrification of some Fertilisers. By W. A. WITHERS and GEORGE S. FRAPS (*J. Amer. Chem. Soc.*, 1901, 23, 318—326. Compare Müntz and Girard, *Abstr.*, 1892, 96; and Johnson, Jenkins, and Britton, *ibid.*, 1900, ii, 506).—Sandy soil (3000 grams) was mixed with different amounts of dried blood, containing 1, 0·5, and 0·25 gram of nitrogen respectively, and kept at about 27° in the dark for 14 days, the percentage of moisture being kept constant. It was found that

as the dilution of the blood with soil increased, there was a distinct increase in the amount of nitrogen nitrified. Addition of calcium carbonate increased the amount of nitrogen nitrified from 100 to 156. The conclusion is drawn that 30 lbs. of nitrogen per acre is a liberal application, especially in the case of substances which, like dried blood, are insoluble in water and become imperfectly mixed with the soil.

Experiments on the rate of nitrification are described, in which the manures, in quantities containing 0.6 gram of nitrogen, were mixed with sandy clay soil (1000 grams) and kept for 3 weeks in darkness. In the case of all the manures except ammonium sulphate (namely, dried blood, cotton seed meal, dried fish, tankage, bat guano, and bone), the order of nitrification accorded with the results of vegetation experiments, the results obtained by the permanganate method, and, with the exception of bone, with those of the pepsin hydrochloric acid method (Johnson, Jenkins, and Britton, *loc. cit.*). Addition of calcium carbonate in every case except bone, considerably increased the amount of nitrogen which nitrified; in the case of ammonium sulphate, the quantity of nitric nitrogen formed was 2,390, taking the amount in absence of calcium carbonate as 100. The rate of nitrification of bone was diminished by calcium carbonate.

The comparatively slow nitrification of ammonium sulphate is attributed to the presence of micro-organisms, which act more readily on organic nitrogen. Or the presence of ammonium sulphate may hinder the activity of the nitrifying organisms. Boname found that ammonium sulphate is nitrified very slowly during the first and second months, but very rapidly during the third month; these results are directly opposed to those of Müntz and Girard, and of Schläsing.

N. H. J. M.

Processes of Denitrification. By OTTO LEMMERMANN (*Bied. Centr.*, 1901, 30, 368—369; from *Habilitationsschr. Jena*, 1900).—The functions of the denitrifying bacteria, of which 23 varieties are now known, are controlled by the absence or presence of suitable carbonaceous matter and oxygen, when the conditions are in other respects normal.

The results of experiments made in Halle, Lauchstädt, and elsewhere, indicate that in practice denitrification has not the importance which has been ascribed to it. The unsatisfactory results sometimes obtained with stable manure cannot to any extent be due to the liberation of free nitrogen, and are more probably owing to direct injury to the plants by the absorption of large amounts of organic matter.

N. H. J. M.

Denitrification in Soil. By G. AMPOLA and C. ULPANI (*Gazzetta*, 1901, 31, i, 185—221. Compare *Abstr.*, 1899, ii, 444).—The authors discuss the work done up to the present on the denitrification question, and describe experiments showing that, if the soil fulfils the conditions necessary for denitrification, that is, if it contains bacteria, nitrate, and assimilable organic material, the nitrate is completely reduced to free nitrogen. Hence, stable manure and sodium nitrate

should not be applied simultaneously, but the former should be allowed to reach its full maturity in the soil before the latter is added. A large number of experiments have been made on the cultivation of wheat, beet, vetches, tobacco, and geraniums on plots, (1) without manure, (2) with calcium nitrate and mineral superphosphate, and (3) with sodium nitrate and mineral superphosphate. The results obtained with wheat and beetroot show that: (1) manuring with calcium nitrate gives a larger product than when the sodium salt is employed; (2) this result is more marked in the case of an exhausted soil, but is quite evident with a soil containing in itself a large proportion of fertilising substances; (3) the question of denitrification must be divided into two distinct parts, according as the fermentation takes place in connection either with chemical manuring with sodium nitrate or with calcium nitrate, which is the final product of nitrification. The smallness of the amount of nitrogen made use of by the plant when sodium nitrate and stable manure are applied simultaneously is shown by the experiments mentioned above to be due to denitrification. Calcium nitrate is a better manure than sodium nitrate, and the former also offers far greater resistance to denitrifying micro-organisms than does the sodium salt.

T. H. P.

Evolution of Sulphur and Phosphorus during the commencement of Germination. By GUSTAVE ANDRÉ (*Compt. rend.*, 1901, 132, 1577—1579).—The results of experiments with haricots showed that the minimum weight of the dry organic matter is reached at the time of the apparent end of germination (13 days). The weight of the ash increased during this period from 4.66 (the amount in 100 seeds) to 7.53 grams. At the end of 20 days, the weight of the plant was 21.4 per cent. more than that of the seeds.

During normal germination, the total sulphur increases regularly from the commencement, the increase being about 50 per cent. by the time the weight of the seedling has reached that of the original seed.

The phosphorus in the form of phosphates increases during germination, whilst the total phosphorus remains stationary until the nitrogen increases.

N. H. J. M.

Sensibility of higher Plants to the action of Potassium Salts. By HENRI COUPIN (*Compt. rend.*, 1901, 132, 1582—1584).—Young wheat plants were grown in solutions of potassium salts and in distilled water. The strongest solution contained 0.0005 gram of potassium phosphate in 100 c.c., and there were twelve other solutions containing from $\frac{1}{2}$ to $\frac{1}{4096}$ of this amount. A comparison of the length of the third leaf in each case showed the most dilute solutions, beginning with the twelfth, which contained 0.000244 mg. of the salt, are without effect. Experiments made with other potassium salts showed that the limits at which they ceased to have any effect were as follows: K_2CO_3 , 0.0001; K_2SO_4 , 0.0008; KCl, 0.003; and KNO_3 , 0.004 milligram.

N. H. J. M.

Investigations on the Roots of Plants. By HERMANN MÜLLER-THURGAU (*Bied. Centr.*, 1901, 30, 398—399; from *Jahresber. Wädensweil*, 8, 79. Compare Abstr., 1900, ii, 361).—Further evidence has been obtained that roots utilise certain substances directly for their

own development and that in too dilute solutions the growth of roots is less abundant. Solutions which are too concentrated retard root production. Solutions containing 0.1 per cent. of dissolved salts gave better results than 0.05 per cent. solutions; 0.2 per cent. solutions did not give more root growth than the 0.1 per cent. solution, and may even give less, and a 0.3 per cent. solution was found to be injurious.

N. H. J. M.

Occurrence of Maltol in the Needles of the Silver Fir (*Abies Alba*).—By W. FEUERSTEIN (*Ber.*, 1901, 34, 1804—1806).—Maltol, $C_6H_6O_3$, can be extracted from the needles of the silver fir (*Abies alba*) by macerating with water, and is identical with that prepared from malt by Brand (Abstr., 1894, i, 270), and by Kiliani and Bazlen (Abstr., 1895, i, 80); it crystallises from dilute alcohol in long, silky needles and melts at 159°.

T. M. L.

Conditions of the Production of Proteids in Plants. By ADOLF MAYER (*Landw. Versuchs-Stat.*, 1901, 55, 453—461. Compare Abstr., 1893, ii, 224).—Rye was grown in pots, without and with gradually increasing amounts of ammonium nitrate. The air-dried substance, without nitrogenous manure, contained 1.28 per cent. of nitrogen as crude proteid, and 0.83 per cent. of proteid nitrogen by Stutzer's method, whilst the plants manured with 22.5 grams of ammonium nitrate contained 3.23 and 1.30 per cent. respectively. The nitrogen as nitrates in the air-dried plants increased from 0.07 to 0.50 per cent. The pure proteids did not, therefore, increase in the same proportion as the crude proteids, and the plants which received the largest amount of ammonium nitrate contained a good deal of it unaltered.

Similar experiments with peas, showed that whilst the crude proteid nitrogen increased from 2.20 to 4.20, the increase in pure proteid nitrogen was very much less (1.61—1.87 per cent.).

Field experiments are described in which oats were grown (1) without manure, and (2 and 3) with sodium nitrate (11.5 and 22.5 kilos. per are respectively). The following amounts of nitrogen were found in the air-dried substance (total and proteid nitrogen by Jodlbauer's and Stutzer's methods):

	Total N.	Proteid N.	N. as N_2O_5 .
1	1.80	0.72	0.036
2	2.71	0.88	0.68
3	2.23	0.90	1.21

N. H. J. M.

Toxic Value of Mercuric Chloride and its Double Salts. By JUDSON F. CLARK (*J. Physical Chem.*, 1901, 5, 289—316).—It has been generally considered that the addition of acids and of various salts increases the toxic value of mercuric chloride owing to decrease in the precipitation of the mercuric chloride by proteids. The author has investigated the question more fully, and determined the concentration of the mercuric chloride which inhibits the growth of various fungi, seedlings, and bacteria, employing decoctions of sugar beet and also liquids free from proteids as media. The results

are expressed by curves which give the inhibitory concentration against quantity of added salt. The following general results appear from these curves: the first additions of salt cause an increase of the toxic value, which reaches a maximum, further addition decreases the toxic value until a minimum is attained after which a further increase, ascribable to the actual effect of the salt itself, occurs. The author considers that the increase in toxic effect is due to the formation of HgCl_4 ions; the later decrease, to the decrease of the dissociation, and hence to the decrease in these ions. The usual instructions for adding sodium chloride to mercuric chloride for antiseptic purposes recommend a quantity of the former which would considerably lower the toxic value of the disinfectant (Abstr., 1899, ii, 627).

L. M. J.

Cultivation of Wheat. By ITALO GIGLIOLI (*Cultura del Frumento. Portici*, 1901, pp. xx and 159).—Field experiments on wheat have been made at Suessola (Naples) during the last thirteen years. Since the first year of the experiments, maize has been grown after wheat each season.

The continuously manured plots produced 10.2 hectolitres of grain and 2,070 kilos. of straw per hectare. With ammonium sulphate, the yield of grain and straw was increased to 17.6 hectolitres and 2,750 kilos. respectively. The highest yield was obtained with horse-dung and ammonium sulphate (21.3 hectolitres of grain and 4,080 kilos. of straw).

The author has previously called attention to the importance of preserving urine by adding sulphuric acid to it and employing the mixture as manure, and in the experiments now described it was found that "sulphuric urine" produced an effect similar to that of ammonium sulphate. Good results were obtained with sodium nitrate in conjunction with horse-dung. Basic slag was found to have more effect than mineral phosphates.

Leucite in conjunction with basic slag, ammonium sulphate, and sodium nitrate produced 16.95 hectolitres of grain and 3,670 kilos. of straw per hectare.

Electricity, especially voltaic, produced a marked increase on the plots which received horse-dung.

The application of manganese dioxide, in conjunction with various manures, produced a decided increase in several cases, as compared with the manures without manganese.

N. H. J. M.

Wheat and Vine Culture. By VINCENZO OLIVERI and F. ROMANO (*Gazzetta*, 1901, 31, i, 253—262).—With the view of arriving at a system of rational manuring of soil for wheat and vine growing, the authors have carried out analyses of the grain, straw, and chaff of wheat, and of the wood and the various parts of the fruit of vines. Tables are given recording the results obtained.

T. H. P.

Alinit Experiments with Oats. By BERNARD SCHULZE (*Bied. Centr.*, 1901, 30, 421; from *Jahresber. agrik.-chem. Versuchs-Stat. Breslau*, 1899, 20).—Negative results were obtained when alinit was applied alone and with dextrose or straw extract. The soil contained very little nitrogen.

N. H. J. M.

Peas, Beans, and Vetches and their Mill Products. By ALBERT KOEHLER (*Landw. Versuchs-Stat.*, 1901, 55, 401—434).—A summary of the results of analyses of the seeds and their products, and also of the feeding experiments made by different investigators.

N. H. J. M.

Vegetation Experiments in 1899. By JOSEPH HANAMANN (*Bied. Centr.*, 1901, 30, 419; from *Zeit. landw. Versuchswesen Oesterr.*, 1900, 3, 575. Compare Abstr., 1900, ii, 41).—Mustard was grown in the pots previously employed for barley, without further addition of manure.

The amounts of phosphoric acid taken up from the different soils by the plants, and also the amounts dissolved by 5 per cent. formic and by 2 per cent. citric acid, are given in a table. The results indicate that 5 per cent. formic acid is the more suitable solvent for indicating approximately the amount of available mineral matters in the soil.

N. H. J. M.

Experiments with Calcium Carbonate on Serradella. By BERNARD SCHULZE (*Bied. Centr.*, 1901, 30, 421—422; from *Jahresber. agrik.-chem. Versuchs-Stat. Breslau*, 1899, 23).—The yield of serradella was reduced from 104.75 grams to 67.5, 39.7, 10.95, and 0 gram (dry matter) respectively by adding 0.5, 1, 2, and 5 per cent. of calcium carbonate to the soil. Similar results were obtained with lupins. The soil was intentionally kept dry to resemble the conditions in fields; possibly calcium carbonate would be less injurious in presence of more moisture.

N. H. J. M.

Nutrition of Sugar Beet. By JULIUS STOKLASA (*Bied. Centr.*, 1901, 30, 393—395; from *Bl. Zuckerrübenbau*, 1900, 161 and 178. Compare Abstr., 1899, ii, 45).—During the first period of the development of sugar beet, the leaf contains 1.3 and the roots 2.8 per cent. of nuclein; in the roots, the amount decreases to 1.5 per cent. as the amount of sugar increases. The leaves of roots with high percentage of sugar contain much ash with much phosphoric acid and potash. Potassium and sodium oxides seem to play an important part in neutralising organic acids, especially oxalic acid, which amounts to 8 per cent. of the dry matter of the leaves. Potassium chloride acts in the production of carbohydrates, such as hemicellulose, cellulose, and lignin substances containing pentosans, of which the beet contains more than 14 per cent. in the first year of growth (compare Abstr., 1900, ii, 100). Lime is of importance in the production of ligno-cellulose and the skeleton, the ash of which contains 75 per cent. of lime. The root activity of the sugar beet has mainly an electro-negative character, whilst that of some cereals, such as barley, has a more electro-positive character. The pure ash of sugar beet contains about 68 per cent. of alkali oxides and 12.7 per cent. of phosphoric and silicic acids, whilst the ash of barley contains 24 per cent. of alkali oxides and 61 per cent. of phosphoric and silicic acids.

N. H. J. M.

Milk Proteid as Food. By BACKHAUS and R. BRAUN (*Bied. Centr.*, 1901, 30, 372—375; from *Ber. Landw. Inst. Univ. Königsberg*, 5, 34—59).—The results of feeding experiments with a dog showed that proteid in the form of casein gave better results as regards increase of weight than meal. Insoluble casein had the same effect as the soluble preparation.

Metabolism experiments with rabbits showed that 94·1—99·48 per cent. of milk proteid was utilised.

Soluble proteid is best obtained by mixing trisodium phosphate (6—8 per cent.) with dry proteid; a mixture of sodium phosphate and citrate and borax is also suitable. Borax is beneficial as a preservative, and it was found, by experiments with rabbits and mice, that very large amounts of borax mixed with casein may be consumed without injury. In some cases, the animals died, but it is uncertain whether this was due to borax.

N. H. J. M.

Feeding with Molasses and Molasses-foods. By AL. VELICH (*Zeit. Zuckerind. Böhm*, 1901, 25, 372—383 and 415—420).—The earliest feeding experiments with molasses are those of Stöckhardt (1850), in which sheep were fed with hay, and with hay and molasses; the results were satisfactory. In 1860, Henneberg and Stohman, in experiments with bullocks, also obtained good results, and found that 8 kilos. of molasses per 1000 kilos. of live weight was the greatest amount completely utilised, and that this quantity was not injurious.

The results of more recent experiments, both with molasses and with mixtures of molasses with various substances, are discussed. The conclusion is drawn that molasses is to be recommended for feeding cattle and horses, but that it should at first be given in gradually increasing amounts.

N. H. J. M.

Seaweed as Food. By P. R. SOLLEID (*Bied. Centr.*, 1901, 30, 375—377; from *Tidsskr. Norsk. Landbr.*, 1901, 13—30).—Analyses of the following varieties were made: (1, *a* and *b*) *Fucus serratus* (2, *a* and *b*), *F. vesiculosus*, (3) *Ascophyllum nodosum*, (4) *Laminaria saccharina*, (5) *Sarcophyllis edulis*.

	Water.	Crude proteid.	Digestible proteid.	Pentosans.	Crude fibre.	Fat.*		Ash.
						1.	2.	
1a.	10·84	9·63	1·75	7·68	5·40	—	1·30	24·16
1b.	11·08	8·33	0·75	6·85	9·95	1·49	—	17·52
2a.	16·43	11·63	4·56	7·59	8·15	2·26	1·53	22·27
2b.	12·40	6·88	0·13	9·41	6·55	2·80	2·39	17·06
3.	13·00	9·44	3·38	10·21	4·13	3·95	3·03	21·51
4.	8·42	10·63	6·00	6·22	5·52	0·70	0·49	13·33
5.	14·12	16·44	12·50	2·86	3·15	0·28	0·24	19·08

1a, 2a, and 3 were dried in their natural state; the rest were first washed with fresh water, with the result that, not only the amount of ash, but also of the digestible proteid were reduced.

It is thought that the plants would be suitable for feeding if mixed with nitrogenous refuse such as herrings and whale meal.

N. H. J. M.

* Extracted (1) with ether, (2) with light petroleum.

[Preservation of Farmyard Manure.] By PAUL WAGNER (*Bied. Centr.*, 1901, 30, 370—371; from *Hess. Landw. Zeit.*, 1900, 435).—To prevent loss of nitrogen in stable manure, the activity of nitrifying organisms should be promoted, in order that their action may predominate over that of the denitrifying organisms. Another method would be to induce a rapid and complete transformation of the ammoniacal nitrogen of the manure into proteid nitrogen, after ascertaining whether the nitrogenous compounds so produced are sufficiently active.

N. H. J. M.

Composition of Odessa Sewage. By THEODOR T. SELIWANOFF, CHOINA, MOTCHAN, and BONDAREFF (*Landw. Versuchs-Stat.*, 1901, 55, 463—474).—The sewage, which is employed for irrigation, is more concentrated than the sewage of Paris, Berlin, and Breslau. Its composition varies considerably, not only on different days, but at different hours, and there seems to be no relation between the composition and the temperature, or the amount of rain. The insoluble dry matter varies in amount more than the dissolved matter, and of the single constituents, chlorine varies the most.

N. H. J. M.

Drain-water and Salt Swamps of the Odessa Irrigation Fields. By THEODOR T. SELIWANOFF (*Landw. Versuchs-Stat.*, 1901, 55, 475—478).—The drainage is shown to be very suitable for irrigation, except as regards phosphoric acid, which is absent. The analysis of the drainage showed that it contains N as NH_3 , 0.0035; N as N_2O_5 , 0.378; and K_2O , 0.185 per thousand.

By means of drainage, and by slightly raising the level of the ground, much of the low-lying land, which contains large amounts of sodium chloride, can be rendered fertile.

N. H. J. M.

Analytical Chemistry.

Preparation of Strictly Tenth-Normal, Fifth-Normal, &c., Hydrochloric or Nitric Acid. By RICHARD K. MEADE (*J. Amer. Chem. Soc.*, 1901, 23, 343—347. Compare this vol., ii, 342).—The sulphuric acid liberated from a solution of pure crystallised copper sulphate is mixed with an equivalent quantity of barium chloride or barium nitrate and the whole is diluted to a litre, and an amount of water is added sufficient to compensate for the volume of the barium sulphate. For instance, if 12.487 grams of crystallised copper sulphate have been taken, 12.215 grams of crystallised barium chloride or 13.076 grams of barium nitrate will be required, and the volume of the precipitate will amount to 2.6 c.c.; a $N/10$ hydrochloric or nitric acid will be the result.

L. DE K.

Estimation of Hydrogen in Gas Mixtures. By FRANCIS C. PHILLIPS (*J. Amer. Chem. Soc.*, 1901, 23, 354—356).—The hydrogen is burnt as usual by passing the mixture of the gas with air over

palladium asbestos, but to prevent the asbestos from becoming damp, the author heats the tube containing it in hot water. In order that the gas measurements may not be affected by the close proximity of the burette to the source of heat, the following arrangement is recommended. A brass cylinder, 30 cm. long and 18 cm. wide, open at both ends, its rims being strengthened by wires, is silvered on both sides. Its inner surface has three supports riveted to it, on which rests a cup-shaped, brass vessel 18 cm. deep and 12 cm. wide, silvered on the outside. This vessel is filled with water, which is raised to nearly the boiling point by means of a small gas flame. The tube containing the palladium asbestos is bent into a U shape, and this is placed in the water. The operation is then conducted as usual.

L. DE K.

Influence of Selenium on Certain Tests for Arsenic. By OTTO ROSENHEIM (*Chem. News*, 1901, 83, 277—280).—Selenium may be occasionally present in substances to be tested for arsenic. When using Marsh's apparatus connected with a wash-bottle containing lead acetate, the presence of selenium does not necessarily interfere with the formation of true arsenical mirrors, and it is only when the amount of selenium is comparatively large that a deposit is obtained in the generating flask of arsenic triselenide, and the formation of arsenical mirrors is thus totally or partially prevented.

Gutzzeit's test, where the material is treated with hydrochloric acid and zinc, and the resulting hydrogen tested with solution of silver nitrate or mercuric chloride, is also similarly interfered with by large quantities of selenium. Reinch's test is also interfered with by selenium, but the author states that it may be rendered useful by first heating the liquid repeatedly with silver foil, which gradually removes the selenium; the arsenic may then be deposited as usual on copper. Bettendorf's stannous chloride test is interfered with by the presence of selenium, and Bloxam's electrolytic process does not appear quite safe, as traces of hydrogen selenide are formed.

L. DE K.

Estimation of the availability of Organic Nitrogen in Commercial Fertilisers. By JOHN PHILLIPS STREET (*J. Amer. Chem. Soc.*, 1901, 23, 330—338).—After estimating the total nitrogen, a quantity of material equivalent to 0.075 gram is, if necessary, washed with cold water, and then heated for 30 minutes in an Erlenmeyer flask on the steam-bath with 100 c.c. of a solution of potassium permanganate (16 grams per litre). The undissolved matter is collected, washed with 150 c.c. of water, and the nitrogen again estimated. The difference between the two determinations represents the available nitrogen. It does not, of course, claim to show the exact amount of organic nitrogen available to the plant, but it serves as a useful means of distinguishing high class products from comparatively worthless ones.

A lengthy table is appended, which shows that in the case of the more valuable manures (dried blood, dried fish, tankage) the greater portion of the nitrogen is soluble, but that little is soluble in the case of garbage, hair, leather, &c.

L. DE K.

Improving the Delicacy of the Diphenylamine Test for Nitric Acid. By RUDOLF HEFELMANN (*Zeit. öffentl. Chem.*, 1901, 11, 200).—The author uses the following process for the detection of nitrates in milk. One c.c. of milk serum is put into a wine glass and a solution of diphenylamine in sulphuric acid is carefully run down the side of the glass. A few small particles of pure sodium chloride are sprinkled over the milk serum; these, when sinking, come into contact with the sulphuric acid and evolve hydrogen chloride, which then causes a beautiful blue zone if nitrates are present. The test may be also applied to waters.

L. DE K.

Detection and Estimation of Nitrates in Water with Brucine and Glacial Formic Acid. By PAÛL CAZENEUVE and H. DÉFOURNEL (*Bull. Soc. Chim.*, 1901, [iii], 25, 639—640).—A delicate test for the presence of nitrates in drinking water consists in evaporating a litre of the water, redissolving in 20 c.c. of distilled water, and evaporating again with 0.05 gram of brucine. If nitrates are present, the addition of glacial formic acid and a little water causes the development of a yellow colour, passing into pink in about 12 hours. This method has the advantage that formic acid, unlike sulphuric acid, is usually quite free from nitrates.

T. M. L.

Detection and Estimation of Nitric Acid in Combination with the Alkali Metals. By EDGAR P. PERMAN (*Chem. News*, 1901, 83, 193).—The author has observed that alkali nitrates when heated with lead sulphate or alum yield alkali sulphates with evolution of red nitric fumes.

The process may be made quantitative by heating the nitrate with anhydrous potash alum for a few minutes at a low red heat, when the loss in weight will represent nitric pentoxide. Chlorides should be absent, as they would cause the formation of volatile aluminium chloride.

L. DE K.

Bleaching of Magnesium Pyrophosphate by Conversion into Magnesium Pyrosulphophosphate. By HENRI PELLET (*Ann. Chim. anal. appl.*, 1901, 6, 211—212).—When blackish-looking magnesium pyrophosphate is dissolved in a little strong sulphuric acid, and then evaporated and gradually heated to redness, a perfectly white residue is obtained which, however, is no longer magnesium pyrophosphate, but has retained a molecule of sulphuric anhydride; the author calls it magnesium pyrosulphophosphate. For calculating it into magnesium oxide or phosphoric oxide, the factors 0.265 or 0.470 are used respectively.

L. DE K.

Estimation of Soluble Lead in Resinate-Driers. By RUDOLF HEFELMANN (*Zeit. öffentl. Chem.*, 1901, 11, 202).—As only that portion of the metal which is combined with the resin acids or the acids of linseed oil is of value, all suspended metallic oxides, &c., being worthless, the following method has been devised. Twelve to fifteen grams of the resinate are extracted with chloroform, the liquid is poured off, filtered into a 250 c.c. flask, and diluted to the mark. Fifty c.c. are mixed in an Erlenmeyer flask with an excess of a saturated solution of hydrogen sulphide in absolute alcohol, which precipitates the lead. The

sulphide is collected, washed with a mixture of alcohol and chloroform, converted into sulphate, and weighed. Manganese is estimated in another part of the chloroform solution after evaporation and burning off the organic matters.

L. DE K.

Volumetric Estimation of Iron and Tin by means of Stannous Chloride. By CONSTANTIN ZENGELIS (*Ber.*, 1901, 34, 2046—2050. Compare Campbell, *Zeit. angew. Chem.*, 1888, 168).—The method depends on the use of sodium molybdate as indicator, this, in the presence of the least excess of stannous chloride, yielding the characteristic molybdenum-blue. The blue colour is also given by cuprous chloride, but not by ferrous chloride. For the estimation of iron, the iron is converted into the ferric state and is then titrated with standard stannous chloride until the colour becomes very faint, the solution is boiled for a few minutes and a drop added to a drop of the indicator in a small porcelain dish; if no blue colour is developed, a few more drops of stannous chloride solution are added, the liquid again boiled, and the test repeated. An excess of hydrochloric acid does not appear to affect the end reaction.

For the estimation of tin, the metal is converted into stannous chloride, then oxidised with an excess of standard ferric chloride solution, and the excess of iron estimated as before with standard stannous chloride. Ordinary ammonium molybdate solution containing nitric acid may be used as indicator if freshly prepared, but after 1—2 weeks it no longer gives the blue colour with stannous chloride. The addition of a drop or two of a phosphate or arsenate, however, restores the property.

J. J. S.

Separation of Nickel and Cobalt. By ARTHUR ROSENHEIM and ERNST HULDSCHINSKY (*Ber.*, 1901, 34, 2050—2057).—The solution containing nickel and cobalt is mixed with an excess of ammonium thiocyanate (12 grams for 50 c.c. of liquid), and then shaken in a Rothé's apparatus with a mixture of amyl alcohol (1 vol.) and ether (25 vols.). The cobalt is removed by the ethereal liquid in the form of a complex thiocyanate (Treadwell, this vol., ii, 284) and the nickel remains in the aqueous liquid; this is evaporated to dryness, carefully ignited, dissolved in dilute nitric acid, and the nickel estimated electrolytically in the presence of ammonium oxalate.

The ethereal solution is shaken with a little dilute sodium hydroxide to remove any iron and then with 15—20 c.c. of 10 per cent. sulphuric acid. The acid cobalt solution is evaporated down, the excess of sulphuric acid driven off, and the cobalt determined electrolytically. The results obtained are remarkably good except when only minute quantities of cobalt are present with large quantities of nickel.

J. J. S.

Separation of Cobalt and Nickel by Electrolysis. By DIMITRI BALACHOWSKY (*Compt. rend.*, 1901, 132, 1492—1495).—On electrolysis at 70—80°, with a current of 0.8 ampere per ND_{100} and an *E.M.F.* of 1 volt, an acetic acid solution of cobalt and nickel containing 3 grams of ammonium thiocyanate, 1 gram of urea, and 1—2 c.c. of ammonium solution for each 0.3 gram of metal, the nickel is deposited

at the cathode in the form of sulphide, the precipitate being complete in one and a-half hours. The sulphide is dissolved in nitric acid, the sulphur removed by filtration, and the metal reprecipitated by electrolysis, either by Classen's method, or in a solution containing ammonium acetate, succinic acid, and carbamide. The cobalt solution is evaporated with nitric acid, the sulphur removed by filtration, and the filtrate electrolysed either by Classen's or the author's method. In the latter process, the solutions are maintained at 70—80°, the current employed being 0·8—1·0 ampere and *E.M.F.* 3·5 volts; the precipitation of cobalt is complete in 3 hours, whilst 4 are required for the deposition of nickel. The results obtained are represented in tabular form.

G. T. M.

Separation of Tungstic and Silicic Acids. By HORACE L. WELLS and F. J. METZGER (*J. Amer. Chem. Soc.*, 1901, 23, 356—358).—Herting (this vol., ii, 284) having stated that the separation of silica from tungstic acid by means of hydrofluoric acid yields erroneous results, the authors have reinvestigated the process and found it to be perfectly trustworthy. The results are the same whether the mixture is evaporated with hydrofluoric acid alone or with the addition of sulphuric acid. The indifferent results obtained by Herting are probably due to the use of the blast, as at a high temperature tungstic acid is sensibly volatile.

L. DE K.

Chemico-toxicological Investigation of Bromoform and of Bromal. By DIOSCORIDE VITALI (*L'Orosi*, 1901, 24, 145—151. Compare Abstr., 1882, 777).—The main portion of this paper has already appeared (this vol., ii, 480). When the quantity of bromoform is very small, it may be detected by burning the hydrogen under a beaker or microscope slide moistened with ammonia, the ammonium bromide thus formed crystallising in dendritic masses.

Bromal may be recognised in the distillate from the acidified material by the addition of ammonium sulphide, with which it gives a red coloration on warming. The liquid may then be mixed with potassium hydroxide and tested for bromoform by any of the methods given above.

For determining the amount of bromoform or bromal present, a known proportion, say two-thirds, of the distillate from the acidified viscera or stomach contents is heated in a reflux apparatus with alcoholic potassium hydroxide for 2 hours, after which the alcohol is driven off, the liquid neutralised, and the alkaline bromide determined either gravimetrically or volumetrically by means of silver nitrate solution.

T. H. P.

Analysis of Commercial Cyanides. Estimation of Cyanic Acid. A peculiar Double Cyanide. Antidote for Cyanides. By OTTO HERTING (*Zeit. angew. Chem.*, 1901, 585—586).—Cyanogen existing as cyanide is best estimated by the process devised by Denigès, and described by Mellor (this vol., ii, 202).

The author describes a new process for the estimation of potassium cyanate. 0·2—0·5 gram of the sample is dissolved in a few c.c. of water, mixed with excess of hydrochloric acid, and evaporated to dryness; the residue contains the nitrogen of the cyanate as ammonia, which is then estimated by distillation with an alkali in the usual

manner. If it is desired to estimate potassium by means of platonic chloride, the residue obtained on evaporating commercial potassium cyanide with hydrochloric acid should be calcined so as to expel ammonium compounds.

The author has met with a peculiar impure compound of potassium and ammonium cyanide in white, amorphous lumps with a strong odour of hydrocyanic acid, and containing 35.85 per cent. of cyanogen, 31.45 per cent. of potassium, and 15.83 per cent. of total nitrogen.

A subcutaneous injection of a 3 per cent. solution of hydrogen peroxide is recommended in cases of poisoning by fumes of hydrocyanic acid.

L. DE K.

Rapid Estimation of Sugar in Beets. By R. S. HILTNER and R. W. THATCHER (*J. Amer. Chem. Soc.*, 1901, 23, 299—318).—The process is based on the fact that beets may be assumed to contain 83 per cent. of water, and that the polariscopic reading is not sensibly affected by the moisture varying a few per cents.

The sample of pulp properly rasped is weighed into a tared capsule, a table is consulted and the required amount of water containing basic lead acetate (about three times the weight of the sample) is added, the capsule is covered with a tightly fitting lid, and the contents thoroughly shaken. The liquid is then filtered and the filtrate polarised.

L. DE K.

A new Sugar Reaction. By T. SOLLMANN (*Chem. Centr.*, 1901, i, 1245; from *Centr. Physiol.*, 25, 34—36).—Ordinary Fehling's solution may be replaced by a cobalt or nickel solution prepared by mixing 10 c.c. of a 1 per cent. solution of cobalt nitrate or nickel sulphate with 50 c.c. each of a 10 per cent. solution of sodium hydroxide and a 5 per cent. solution of sodium potassium tartrate. The nickel solution is apple-green; on boiling with dextrose, it becomes yellow. The cobalt solution is at first colourless; it gradually becomes blue-green, or on boiling sky blue. When boiled with dextrose, its colour passes through emerald green and yellowish-green to reddish-brown. The reaction is $1\frac{1}{2}$ —2 times as sensitive as that with copper. Both reagents give the reaction with dextrose, invert sugar, lactose, galactose, aldehydes, and various gums. Proteids also produce characteristic colour changes, but distinct from those given by sugars. M. J. S.

The Amount of Pentosans in Gum Arabic. By RUDOLF HEFELMANN (*Zeit. öffentl. Chem.*, 1901, 11, 195—198).—A table is given showing the commercial value, percentage of water and ash, and the amount of furfuraldehyde yielded by 1 gram of 24 specimens of gum arabic of different origin and also of cherry-gum. The table also contains the amount of pentosans and araban corresponding with the furfuraldehyde. The estimation of the pentosans is not, as was hoped, of much practical value in detecting an admixture of cherry-gum in gum arabic.

The analytical process followed was that of Tollens and Flint (*Abstr.*, 1896, ii, 580), in which the furfuraldehyde is precipitated with phloroglucinol.

L. DE K.

Estimation of Pentosans. By GEORGE S. FRAPS (*Amer. Chem. J.*, 1901, 25, 501—508).—The method of estimating pentosans in vegetable materials consists in distilling the substance with hydrochloric acid and precipitating the furfuraldehyde in the distillate with phloroglucinol; this distillate may, however, also contain fatty acids, a substance which slowly separates as a black precipitate, and another substance, provisionally termed 'furaloid,' which is destroyed by redistillation; all these compounds may appear in the phloroglucinol precipitate.

The author has proved that the loss which occurs on redistilling the distillate is not due to oxidation, or to decomposition of the furfuraldehyde, and is therefore occasioned by some substance (or substances) which precipitates phloroglucinol and is destroyed, wholly or in part, by a second distillation. This 'furaloid' was determined in a number of vegetable substances by the following process. The material was distilled with hydrochloric acid, the distillate was divided into two portions and one portion redistilled; the loss was assumed to represent the 'furaloid' present. All the materials tested yielded 'furaloid,' the quantity varying from 7 to 23 per cent. The substances which furnish the 'furaloid' are hydrolysed by 1.25 per cent. sulphuric acid, and on evaporation the 'furaloid' is lost. On hydrolysing the excrement of a sheep fed with timothy hay, it was found that the substances which yield the 'furaloid' had disappeared to a greater extent than the pentosans; their digestibility is about 75 per cent. compared with 60 per cent. for that of pentosans. The 'furaloid' is not formed by the action of hydrochloric acid on pentoses. E. G.

Estimation of the True Amount of Starch in Potatoes. By PAUL BEHREND and H. WOLFS (*Zeit. angew. Chem.*, 1901, 461—465).—The method proposed by Baumert and Bode for the estimation of real starch in potatoes (this vol., ii, 44) is strongly recommended.

L. DE K.

A new Starchy Product used for Confitures and Creams. By FRENSE (*Ann. Chim. anal. appl.*, 1901, 6, 210—211).—The author has analysed a mixture used for making blanc manges, &c., and found it to consist of sugar and flavouring matter, with 8.5 per cent. of wheat starch. This starch has been subjected to a special treatment, and, although insoluble in cold water, it readily dissolves in boiling water, forming a transparent jelly on cooling. Its microscopical appearance is not destroyed by boiling for a few minutes, and it is also coloured blue by iodine; its detection is, therefore, an easy matter. L. DE K.

Amount of Volatile Fatty Acids in Dutch Butter. By R. RACINE (*Zeit. angew. Chem.*, 1901, 568—571).—The author agrees with Reicher (this vol., ii, 292) and van Ryn (*Abstr.*, 1899, ii, 822) as to the occasional low Reichert-Meissl figure of undoubtedly genuine Dutch butters. L. DE K.

[**Estimation of Alkaloids in Urine.**] By H. GUILLEMARD (*Compt. rend.*, 1901, 132, 1438—1440).—See this vol., ii, 521.

General and Physical Chemistry.

Refractive Indices of Mixtures of Liquids. By J. DE KOWALSKI and JEAN DE MODZELEWSKI (*Compt. rend.*, 1901, 133, 33—35).—The refractive indices (for yellow sodium light) and densities of various mixtures of alcohol and benzene, alcohol and toluene, and chloroform and ether, have been determined. Gladstone's and Lorenz's formulæ can be equally well used for the calculation of the refractive indices of these mixtures according to the mixture rule.

Philip (Abstr., 1898, ii, 9) found that neither of these formulæ (when \sqrt{k} was substituted for the refractive index) agreed with the results obtained for the dielectric constants of liquid mixtures. According to Drude, the difference between the dielectric constant and the square of the index of refraction for long light waves depends on the absorption of the substance in the ultra-red part of the spectrum. Since the anomalies presented by the dielectric constant are not found for the refractive indices, it is probable that it is only the absorption in the infra-red which changes irregularly in the mixtures studied.

J. McC.

Sensitiveness of Diazo-compounds to Light. By OTTO RUFF and VICTOR STEIN (*Ber.*, 1901, 34, 1668—1684).—See this vol., i, 619.

The Chlorine-Hydrogen Gas Cell. By ERICH MÜLLER (Dresden) (*Zeit. Elektrochem.*, 1901, 7, 750—752).—The author points out that Akunoff (this vol., ii, 81) has made two errors in his calculations. When the figures are correctly calculated, the *E.M.F.* of the hydrogen-chlorine cell is 1.37125—0.0008066 volts, and the heat developed by the reaction 36778 cal.

The quantities of heat evolved by the formation of hydrochloric acid in 3*N* solution from hydrogen and chlorine is 37854 cal., whilst from hydrogen and hypochlorous acid it is 37404 cal.

Since, however, chlorine and hypochlorous acid are in equilibrium in the solution, in accordance with the equation $\text{Cl}_2 + \text{H}_2\text{O} \rightleftharpoons \text{HCl} + \text{HClO}$, it is doubtful whether thermochemical measurements can decide which reaction represents the mechanism of the production of *E.M.F.* in the cell. The result should be the same whichever assumption is made.

T. E.

Theory of the Accumulator. By EMIL ABEL (*Zeit. Elektrochem.*, 1901, 7, 731—733).—By applying the equations previously obtained for the potential difference between a metal and a solution containing its *m*- and *n*-valent ions (this vol., ii, 376), the author shows that Le Blanc's theory of the lead accumulator (the peroxide electrode is in equilibrium with Pb^{++} ions) explains its behaviour in as simple a manner as Liebenoff's theory (the peroxide electrode is reversible with respect to PbO_2^{++} ions), and that, therefore, there is no reason to give preference to either view.

T. E.

Electrochemical Behaviour of Nickel Ammonium Sulphate. By W. PFANHAUSER (*Zeit. Elektrochem.*, 1901, 7, 698—710).—The equivalent conductivities of solutions of nickel and ammonium sulphates and of the double salt have been determined, and are tabulated in the original.

In the more concentrated solutions, the conductivity of the double salt is less than the sum of the conductivities of the constituents, a result which indicates the formation of a complex ion. This is confirmed by measurements of the transference numbers, which show that the double salt exists in its saturated solution at 18°, mainly in the form of the ions NH_4 and $\text{Ni}(\text{SO}_4)_2$. In more dilute solutions, however, the ions NH_4 , Ni , and SO_4 exist.

Taking the value of the calomel electrode as -0.56 volt, the following *P.D.*'s between metals and normal solutions of nickel sulphate were found :

Metal.	NiSO_4 .	$(\text{NH}_4)_2\text{Ni}(\text{SO}_4)_2$.
Nickel	-0.041 volt.	-0.060 volt.
Lead.....	-0.005 "	-0.007 "
Zinc.....	$+0.482$ "	$+0.493$ "
Copper.....	-0.569 "	-0.591 "
$\text{Ni}(\text{OH})_3$	-1.135 "	-1.152 "

In electrolysing solutions of nickel sulphate, or of the double salt, with nickel electrodes, polarisation is observed. The lower value (1.06 volts) corresponds with the decomposition of water and evolution of oxygen at the anode. The higher value (about 2.3 volts in neutral, and 1.9 volts in acid, solutions) is attributed to the formation of nickelic sulphate at the anode, the greater part of which is at once hydrolysed to nickelic hydroxide. Attempts to prepare this salt chemically failed, but a solution of nickelic acetate was obtained by dissolving the hydroxide in cold glacial acetic acid. T. E.

Electrolysis of Fused Salts. By RICHARD LORENZ (*Zeit. Elektrochem.*, 1901, 7, 753—761).—A cell containing fused lead chloride with carbon electrodes, the one dipping into fused lead, the other being saturated with chlorine, behaves like an accumulator. When the electrodes are properly separated from each other, the cell maintains a constant *E.M.F.* of 1.2 volts at 600° for 3 hours, so that there is no doubt as to the real *E.M.F.* of this combination. If the dark grey solution of lead surrounding the cathode of the polarised lead chloride cell passes over to the anode, the *E.M.F.* at once sinks, and only returns to its original value when the fused lead chloride surrounding the anode has become transparent again owing to the conversion of the dissolved lead into lead chloride. Unless great care is taken in separating the anode and cathode liquids, the polarisations observed are always lower than the normal values. This partial depolarisation is accompanied by a disappearance of the products of the electrolysis, so that the lower the polarisation the smaller is the yield. It was found that when a lead chloride cell was polarised for a short time and then allowed to discharge, the polarisation fell very rapidly to a fairly constant value, nearly 0.5 volt below the normal *E.M.F.* After each repetition of the polarisation, however, the discharge *E.M.F.*

remained for a longer time at the normal high value before falling, and then passed through the lower value much more quickly. The cause of this was found by studying the evolution of chlorine at the carbon anode. Especially with a new anode the quantity of chlorine evolved in the early stages of electrolysis is considerably less than equivalent to the quantity of lead deposited; since the fused salt round the anode always has the composition PbCl_2 , the missing chlorine is absorbed by the carbon anode, and it is only when this is saturated that the normal value of the polarisation is reached. The apparently anomalous lower values of the polarisation are all due to partial depolarisation.

In passing, the author states that optical experiments have shown that the dark grey "metallic fogs" observed round the cathode are actually solutions of the metals in the fused salts. T. E.

Electrochemical Behaviour of Acetylene. By ALFRED COEHN (*Zeit. Elektrochem.*, 1901, 7, 681—685).—The discharge potential of oxygen from a solution of potassium hydroxide is depressed, when acetylene is passed through the solution, from about 1.7 to 1.2 volts. The chemical reaction of which this depression is an indication is the oxidation of acetylene to formic acid, which takes place quantitatively when the *E.M.F.* employed lies between the above limits.

In solutions of sulphuric acid, the presence of acetylene diminishes the anodic polarisation by about 0.19 volt. The chemical change in this case is the oxidation of acetaldehyde (formed by the action of acetylene on sulphuric acid) to acetic acid. The current efficiency is 100 per cent. when the *E.M.F.* used is less than that required for the liberation of oxygen.

In acid solutions, acetylene does not act as a depolariser for the halogens except in the presence of a carrier, such as phosphorus tribromide, when a considerable depolarisation occurs. T. E.

Applicability of the Law of Mass Action to Strong Electrolytes. By H. VON STEINWEHR (*Zeit. Elektrochem.*, 1901, 7, 685—687).—When electrolytes are dissolved, contraction occurs; this may be taken to indicate an increase in the internal pressure of the liquid. External pressure affects the degree of dissociation, and it is assumed that internal pressure has an equal effect. The degrees of dissociation of two solutions of the same electrolyte are therefore only comparable when measured at the same total (internal + external) pressure. The effect of pressure is given by the equation $RT(\log K_1 - \log K_2) = (p_1 - p_2)\Delta v$ where K_1 and K_2 are the dissociation constants at pressures p_1 and p_2 and Δv is the corresponding change of volume.

To find the increase of internal pressure due to the dissolution of common salt in water, the author makes use of the fact that the rate of inversion of cane sugar by acetic acid is increased in presence of salt. He assumes that the increase of internal pressure due to the addition of the salt increases the dissociation of the acid, and hence the rate of inversion. Since the influence of pressure on the dissociation of acetic acid is known, the pressure required to produce the observed effect is capable of calculation. The dissociation constants of

sodium chloride calculated for the same pressure in the way indicated are much more nearly constant than the uncorrected numbers.

T. E.

The Theory of Electrolytic Dissociation as viewed in the Light of Facts recently ascertained. By LOUIS KAHLENBERG [with ARTHUR A. KOCH and ROY D. HALL] (*J. Physical Chem.*, 1901, 5, 339—392).—An adverse criticism of Arrhenius' electrolytic dissociation theory and its applications. Cryoscopic and ebullioscopic determinations have been made with a large number of salts in aqueous solution over a wide range of concentration; further, conductivity determinations have been made with the same solutions at 0° and 95°. On the basis of this experimental material, it is maintained that there is no such connection between the freezing points and boiling points of solutions on the one hand, and their electrical conductivity on the other, as is claimed by Arrhenius' theory; in numerous cases, there is not even a qualitative agreement. The author examines a number of problems on which the theory has been brought to bear, and contends that, whilst it has stimulated research on many lines, it is quite inadequate as a key to the phenomena of solution.

J. C. P.

Dissociation of Electrolytes. Chemical Dissociation of Copper Sulphate under the influence of Water and Temperature. By C. HENSGEN (*J. pr. Chem.*, 1901, [ii], 63, 554—562).—It is shown that in a solution of copper sulphate saturated at 4° with crystals of the composition $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, the proportion of $\text{CuO}:\text{SO}_3$ changes; after 3 days it is 1:1.014, and after 8 days 1:1.027. If this saturated solution is diluted, the proportion of copper oxide further decreases. Under certain conditions of dilution and temperature, the proportion $\text{CuO}:\text{SO}_3$ in the solution may become 1:1.454.

The author has observed similar changes to take place also in solutions of zinc, magnesium, and calcium salts.

K. J. P. O.

Model illustrating Measurements of the Mobility and Transference of Ions. By B. D. STEELE (*Zeit. Elektrochem.*, 1901, 7, 729—731).—This model illustrates, not only the transference of the ions of a single salt submitted to electrolysis, but also the movement of the boundary between solutions of two salts possessing a common ion for the case that the slower ion follows the faster. To understand the construction, the diagram is required.

T. E.

Speed of Migration of Ions in dilute Solutions. By HANS JAHN [BERLINER, P. BOGDAN, BUKSCHNEWSKI, GOLDBABER, METELKA, OPPENHEIMER, and REDLICH] (*Zeit. physikal. Chem.*, 1901, 37, 673—712).—From exact determinations of the changes of concentration of dilute solutions in electrolytic cells, the following limiting values for the cationic transport numbers have been obtained: Hydrogen (HCl), 0.826, (HNO_3), 0.830; potassium (KCl), 0.497, (KBr), 0.496; sodium (NaCl , NaBr), 0.396; lithium (LiBr), 0.330; barium (BaCl_2), 0.447; cadmium (CdCl_2 , CdBr_2), 0.432, (CdI_2), 0.443; silver (AgNO_3), 0.471; and copper (CuSO_4), 0.375.

J. McC.

An Electrometric Method to determine the Presence of very small Quantities of Electrolytes whose Ions are transported at different Speeds. By MAX OKER-BLOM (*Zeit. physikal. Chem.*, 1901, 37, 665—672).—Two wide Ostwald normal-electrodes with about 8 sq. cm. mercury surfaces are filled with 0.1 *N* potassium chloride solution. The side tubes dip into the wide ends of two small vessels of 2 c.c. capacity, the other ends of which are drawn out so that the bore is 1 mm. and are turned upward. These small vessels contain solutions of sodium chloride of different concentration (0.1 *N* and 0.00001 *N*), or dilute solutions of potassium chloride (0.00001 *N*), one of which also contains mannitol (1 *N*). A small strip of filter paper (15 mm. long \times 3 mm. broad), which has been boiled with distilled water and thoroughly washed, is moistened with a drop of the solution to be examined, and placed so as to connect the narrow ends of the two small vessels. Poggendorff's condensation method is used to determine the *E.M.F.*, an accumulator being employed for comparison, and the direction of the current is indicated by a Lippmann electrometer. Using sodium chloride solutions of different concentration in the small vessels, it has been found that the *E.M.F.* (0.00001 *N* NaCl \rightarrow 0.1 *N* NaCl) diminishes when the filter paper is moistened with lactic acid or potassium dihydrogen phosphate with decreasing concentration of the electrolyte, and ultimately changes direction. Using potassium chloride solutions (0.00001 *N* and 0.1 *N*) instead of the sodium chloride, a similar diminution of *E.M.F.* has been noticed for decreasing concentrations of these electrolytes and hydrochloric acid.

The fact that a current is obtained when the potassium chloride solutions in the small vessels (0.00001 *N* KCl in one, and 0.00001 *N* KCl and 1.0 *N* mannitol in the other) are connected with the filter paper moistened with the solution of the electrolyte (when directly connected there is no current), coupled with the fact that here too the *E.M.F.* diminishes with decreasing concentration of the electrolyte, leads the author to explain the phenomenon as due to the rates of migration of the cation and anion into the two solutions of different viscosity. J. McC.

Cryoscopic Experiments with Methylene Iodide. By FELICE GARELLI and VITTORIO BASSANI (*Gazzetta*, 1901, 31, i, 407—416).—Methylene iodide is a very difficult substance to use as a cryoscopic solvent as it crystallises with extraordinary slowness, so that the thermometric column only very gradually attains the freezing temperature, and it is with great difficulty, and by taking many precautions, that concordant readings can be obtained. The readings made even with the solvent alone oscillate about two points, differing by about 0.4°, as if the liquid possesses two distinct freezing temperatures. From measurements with ethylene dibromide, benzene, and iodine, the molecular depression of the freezing point of methylene iodide is found to be roughly 140. Stannic iodide, arsenic tri-iodide, and mercuric iodide have normal molecular weights in this solvent, and sulphur gives a value corresponding with the molecule S₈. A

sample of not quite pure antimony tri-iodide gave a molecular weight varying from 380.3 to 457.8 instead of to 499.22. T. H. P.

A new Manometer, and the Law of Gas Pressure between 1.5 and 0.01 mm. of Mercury. By LORD RAYLEIGH (*Trans. Roy. Soc.*, 1901, 196, 205—223; and *Zeit. physikal. Chem.*, 1901, 37, 713—734).—An extremely exact measurement of gas pressure can be made with the manometer described, in which a mercury surface is caused to approach a glass point, and the motion necessary to bring about coincidence of the point and its image is measured by a mirror and scale method. At the highest pressure (1.5 mm.) the error may be about 0.001 mm., and at the lowest pressure it amounts only to 0.0004 mm. Using this instrument in the investigation, it has been proved that Boyle's law applies rigorously to nitrogen (containing 1 per cent. of argon), hydrogen, and oxygen within the range of pressure from 1.5 to 0.01 mm.

The anomaly found by Bohr (*Ann. Phys. Chem.*, 1886, [ii], 27, 479) for oxygen, although carefully sought for, could not be confirmed.

J. McC.

Chemical Reactions in Dissolved or Gaseous Systems: Vapour Tension: Avogadro's Hypothesis. By A. PONSOT (*Compt. rend.*, 1901, 132, 1551—1553. Compare Abstr., 1900, ii, 337, 392).—A theoretical paper, in which it is shown that if the solvent takes no part in the reaction, the formation of a system which is the only one capable of existence at infinite dilution, and which decreases as the solvent is abstracted, diminishes the vapour tension of the solvent. The formation of the opposed system, on the other hand, increases this tension. If V_1 is the volume of the solution when system I alone is present, V_2 that when only system II is formed (II being that system which increases with decreasing external pressure) then $\pi(V_2 - V_1)$ must be positive, no matter what value π (the osmotic pressure) has. In a gaseous system $P(V_2 - V_1)$ is positive, P being the pressure exerted on the gas.

If we consider the equilibrium represented by $n_1A + n_2B \rightleftharpoons n_3M + n_4N$, then when only one system is present $PV_1 = n_1p_1v_1 + n_2p_2v_2$ and $PV_2 = n_3p_3v_3 + n_4p_4v_4$ (v being the molecular volume); but $pv = iRT$, therefore (since $V_2 - V_1$ is positive) $i_3n_3 + i_4n_4 > i_1n_1 + i_2n_2$. In limited chemical reactions, the equilibrium of which varies with temperature and pressure, if $n_3 + n_4 = n_1 + n_2$ or if $n_1 = n_2 = n_3 = n_4$, then the values of i must be unequal, which proves that Avogadro's hypothesis is not rigorously exact. The same conclusion may be drawn with regard to solutions.

J. McC.

Gay-Lussac's Law and the Dissociation of Gaseous Compounds. By A. PONSOT (*Compt. rend.*, 1901, 132, 1401—1404).—A mathematical paper in which the author shows that dV/dm (coefficient of increase of volume on account of dissociation) must be positive. This has hitherto been regarded as doubtful, but it is shown to be a consequence of the accepted result that $\delta m/\delta T'$ is positive. When the equilibrium between a gaseous substance and its products of dissocia-

tion is dependent on the pressure, it must also be dependent on the temperature, and variation of either of these will disturb the equilibrium. When the volume or temperature increases indefinitely, the dissociation tends to become complete. Since dV/dm_{PT} is always positive, it follows that the volume of a dissociable gaseous compound is smaller than the volume of the mixture of its dissociation products.
J. McC.

Preparation of Osmotic Membranes by Electrolysis. By HARMON N. MORSE and D. W. HORN (*Amer. Chem. J.*, 1901, 26, 80—86).—A semipermeable membrane may be deposited in the wall of a porous cell by the following electrolytic method. The air is first removed from the wall by putting a solution of potassium sulphate containing 0.5 gram per litre in the cup and the beaker in which it is placed, and passing a current between the electrodes in the direction of the one within the cup; the water in passing through the wall effectively sweeps out the air. The cup is then left in distilled water until required. In order to form the membrane, the wet cup is placed in a beaker and surrounded with an electrode of sheet copper, the electrode within the cup being of platinum; a solution of copper sulphate ($N/10$ or $N/5$) is placed outside, and a solution of potassium ferrocyanide (also $N/10$ or $N/5$) inside the cup, and on passing the current a semipermeable membrane is formed in the wall midway between the two surfaces. A number of experiments made to test the strength of the membranes showed that they are able to withstand a pressure of 4.5 atmospheres.
E. G.

Capillary Constants of Organic Liquids. By PHILIPPE A. GUYE and ACHILLE BAUD (*Compt. rend.*, 1901, 132, 1553—1555. Compare this vol., ii, 437).—An examination of some oximes and urethanes shows that all of these are polymerised in the liquid state. Of the aliphatic urethanes, the methyl derivative is less polymerised than the ethyl, which, in turn, is simpler than the isopropyl compound.

The results so far obtained indicate that polymerisation in the liquid state is associated with the presence of certain groups: OH (alcoholic), OH (acidic), CO (ketones and aldehydes), CN (nitriles), and NH_2 (aromatic amines). Compounds containing two of these groups are more polymerised than those of the same molecular complexity containing only one.

The view is expressed that the polymerisation of liquids as revealed by the capillarity and other physical properties is more of the nature of a chemical phenomenon, analogous to the polymerisation of aldehyde to paraldehyde, or cyanogen to tricyanogen, and is quite different from a physical association of simple chemical molecules.
J. McC.

Resorption of one Solution by another. By MAX OKER-BLOM (*Zeit. physikal. Chem.*, 1901, 37, 744—750).—A copper ferrocyanide film on an insoluble gelatin membrane closes a glass tube of 10 mm. bore. Three c.c. of copper sulphate solution are put into the tube, into which a narrow tube is then tightly fitted, so that the liquid rises about 60 mm. The cell is then placed in a solution of sodium chloride. The film is permeable by water and by [the ions of] sodium chloride,

but does not allow copper sulphate to pass. A normal solution of sodium chloride was used, and various solutions of copper sulphate, the most concentrated of which was 0.5 *N*. The column of liquid in the narrow tube at first falls, since the osmotic pressure of the sodium chloride is greater than that of the copper sulphate. After some time, which depends upon the initial concentration of the copper sulphate, the column reaches a minimum, and then rises to a height which may be considerably greater than it was initially. When the meniscus of the column has reached its lowest point, the two solutions are isotonic, and this has been attained by (1) passage of water from the inside to the outside, whereby the concentration of the copper sulphate has increased and that of the sodium chloride has diminished, and (2) passage of sodium chloride through the film, whereby the molecular concentrations of the two solutions tend to become equal. The succeeding rise of the column is explained by the fact that the sodium chloride tends to distribute itself evenly throughout the combined solution, and as the copper sulphate is prevented from doing so by the film, the molecular concentration of the inner solution becomes greater than that outside the cell, that is, the osmotic pressure is greater inside than outside. The lowest concentration of copper sulphate which is still able to exhibit resorption towards a normal sodium chloride solution has not yet been ascertained.

J. McC.

Physical Properties of Albuminous Micelles. By SWIGEL POSTERNAK (*Ann. Inst. Pasteur*, 1901, 15, 169—208 and 451—496. Compare this vol., ii, 231).—A *résumé* of the properties of colloidal solutions and a comparison of the properties of micelles. The following are the more important conclusions drawn from theoretical considerations and numerous experimental data. The albuminous micelle has a constant elasticity and a variable size, which is increased by heat and decreased by the presence of free ions; the solubility of a colloid is occasioned by the size of the micelles being diminished by an electrical charge from free ions. The author takes the view that the different characters of colloidal micelles are the manifestations of an "adhesive affinity," and that in the precipitation of a colloid by mineral matters the latter must necessarily be present in the precipitate.

R. H. P.

Velocity of Reaction before complete Equilibrium and before the Point of Transition, &c. Part I. By MEYER WILDERMAN (*Phil. Mag.*, 1901, [vi], 2, 50—92. Compare Abstr., 1900, ii, 200).—The paper is largely mathematical and unsuitable for abstraction. A method is described by which the velocities of ice separation, ice melting, and the separation of salts from supersaturated solutions have been investigated. All these reactions are regulated by one and the same general law, as expressed by the equation $\frac{dt}{dT} = K'(t_0 - t)(t - t_{0v} + K)$, where t_0 is the temperature of equilibrium, and t_{0v} is the temperature at which crystallisation is started.

J. C. P.

Reciprocal Influence of Two Catalytic Reactions in the same Medium. By ANGELO COPPADORO (*Gazzetta*, 1901, 31, i, 425—450).—The author has studied the mutual influence which the inversion of sucrose by acids and the hydrolysis of methyl acetate by

acids exert on one another when the two reactions take place in the same medium. The results obtained are given shortly in the following tables, which show the reaction constants obtained under different conditions :

Inversion of sucrose.

Concentration of acid	N/2.5	N/12.5	N/25
„ sucrose	8 per cent.	16 per cent.	16 per cent.
Temperature	25°	40°	40°
HCl { Without methyl acetate....	19.83	63.05	16.87
With 1 c.c. „ „ ..	19.68	57.69	13.77
With 2 c.c. „ „ ..	—	49.81	12.74
H ₂ SO ₄ { Without methyl acetate..	—	32.98	9.11
With 1 c.c. „ „ ..	—	23.49	8.60
With 2 c.c. „ „ ..	—	20.90	8.37

Hydrolysis of methyl acetate.

Concentration of acid	N/2.1	N/12.5	N/12.5	N/25	N/25
„ methyl acetate	1 c.c.	1 c.c.	2 c.c.	1 c.c.	2 c.c.
Temperature	25°	40°	40°	40°	40°
HCl { Without sucrose.....	16.54	9.13	9.85	4.70	5.01
With „ „ ..	16.25	10.25	11.77	5.42	5.74
H ₂ SO ₄ { Without „ ..	—	5.78	6.47	3.23	3.39
With „ „ ..	—	6.47	7.49	3.66	3.89

The velocity of inversion of sucrose is hence diminished by the presence of methyl acetate, and the author considers such diminution to be due entirely to the modification produced in the medium by the addition of methyl acetate, and not to the hydrolysis of the latter. The increase brought about in the rate of hydrolysis of methyl acetate when sugar is present in the liquid is shown by the author to be caused by the increase of the ratio of acid to water, due to the replacement of some of the water by sucrose; when the influence of the volume occupied by the sugar is removed by keeping the quantity of water constant and adding the sugar after the mixture of acid and methyl acetate is made up to volume, the reaction constant is found to be the same when sugar is present as when it is not. The inversion of the sucrose hence exerts no influence on the velocity of hydrolysis of methyl acetate. This conclusion is confirmed by the observation that the sucrose may be replaced by a corresponding quantity of invert sugar without altering the velocity of hydrolysis of methyl acetate.

T. H. P.

Experimental Verification of a Law of Chemical Mechanics.
By H. PÉLABON (*Compt. rend.*, 1901, 132, 1411—1413).—The reaction $\text{HgS} + \text{H}_2 \rightleftharpoons \text{H}_2\text{S} + \text{Hg}$ has been studied by the action of hydrogen on mercury sulphide (with and without excess of mercury), and by the action of hydrogen sulphide on mercury. The four components of the system are volatile, and the results obtained show that $p_1 p_2 / p_3 p_4 = f(T)$, where $p_{(1,2,3,4)}$ are the partial pressures of mercury sulphide, hydrogen, hydrogen sulphide, and mercury respectively.

J. McC.

Comparative Crystallographical Study of the Double Selenates of the Series $R_2M(SeO_4)_2 \cdot 6H_2O$.—Salts in which M is Magnesium. By ALFRED E. TUTTON (*Proc. Roy. Soc.*, 1901, 68, 322—323).—The conclusions reached in the present paper are generally similar to those arrived at from a study of the zinc group (see Abstr., 1900, ii, 593); R represents one of the metals potassium, rubidium, and caesium, and there is a uniform progression in properties parallel to the increase of atomic weight. The progressive diminution of double refraction, however, according to a rule already established, leads in the case of caesium magnesium selenate to such close approximation of the three refractive indices that the crystals of this salt exhibit peculiar optical phenomena.
J. C. P.

Study of Growing Crystals by Instantaneous Photomicrography. By THEODORE W. RICHARDS and EBENEZER HENRY ARCHIBALD (*Amer. Chem. J.*, 1901, 26, 61—74).—It has been suggested by several observers that the formation of crystals is preceded by that of minute globules, which rapidly unite and assume the crystalline form. In order to study this point, the authors have taken a series of successive instantaneous photomicrographs of crystals of sodium nitrate, barium chloride, copper sulphate, and ferrous ammonium sulphate at the moment of their formation. An enlargement of more than 4000 diameters was obtained, and both ordinary and polarised light were used, but in no case was the production of globules detected. It was found that the growth of the crystal is much more rapid during the first second of its formation than at any subsequent period.

The apparatus employed is described with the aid of a diagram, and some of the photographs are reproduced.
E. G.

Modification of Kipp's Apparatus. By F. C. THIELE (*Chem. Zeit.*, 1901, 25, 468).—The top bulb of the "Kipp" is furnished at the bottom with a perforated cork, through which passes a tube reaching upwards to two-thirds of the height of the bulb. The top is fitted with a doubly perforated cork through which passes the usual safety funnel and also an overflow tube reaching nearly to the bottom of the bulb; this tube is connected at the external end with an india-rubber tube furnished in the centre with a screw clamp and connected at the other end with a glass tube, which is in turn connected with a tube bent at an angle of 120° passing through an india-rubber cork down to the bottom of the lower bulb. The central bulb contains the gas-generating mass, and is provided with the usual gas exit tube.

When the apparatus is wanted for use, the top cork is removed and the bulb half filled with acid. After inserting the cork, the screw clamp and the exit tube are opened, and by blowing into the safety funnel, the bent tube is filled with acid. Acid is now poured through the funnel until the lower bulb is nearly full. The apparatus is now closed, and the top bulb filled about one-third with acid. If now the gas tap is opened first, and then the screw clamp, the acid rises rapidly in the central bulb and action sets in; the current is then easily regulated by means of the gas tap. When not in use, the screw clamp is closed first and then the tap; the excess of acid

at once ascends into the top bulb without being able to run back. When the apparatus wants emptying, it is only necessary to remove the glass tube connecting the two pieces of india-rubber, and the screw clamp is opened; the top and bottom bulbs are then speedily emptied. The overflow tube may also be replaced by an open glass tube sealed to the lower bulb; this does away with the blowing through the safety funnel, and the acid circulates automatically.

L. DE K.

Lecture Experiments to Demonstrate the Principle of Conservation of Weight. By ROBERTO SALVADORI (*Gazzetta*, 1901, 31, i, 400—401 and 474—476).—The experiments given by Ostwald (*Grundlinien der anorganischen Chemie*, 1900) to illustrate the conservation of weight during chemical reactions would be more convincing if they were accompanied by an apparent diminution or increase in the quantity of matter taking part in them. The author therefore proposes as lecture experiments: (1) the burning of a piece of phosphorus in a sealed hard glass tube drawn out to a fine point at one end; the tube is weighed before and after burning the phosphorus, the diminution in volume being shown by breaking off the point of the tube under mercury which rises in the tube; (2) in a similar tube, a little concentrated nitric acid and powdered copper are placed out of contact, and the tube sealed and weighed, after which the metal and acid are mixed; when the reaction ceases and the tube cools, it is weighed again to show that no change has occurred, and the point of the tube fused in a flame, when a large volume of red vapours is emitted. Another striking experiment consists in charging one limb of a Λ -shaped tube with sodium amalgam, and the other with saturated aqueous ammonium chloride, sealing the tube, weighing, and then mixing the contents of the two limbs. The tube is rapidly filled with a metallic looking mass of ammonium amalgam, and its weight is found to be unchanged at the end of the reaction.

T. H. P.

Lecture Experiments. By MAXIMILIAN ROSENFELD (*Chem. Zeit.*, 1901, 25, 421—422).—I. Volumetric composition of the air. Iron filings are placed in a small wire-gauze basket attached to a glass rod which passes through the rubber stopper of a gas cylinder. The iron filings are first strongly heated, and then the rubber stopper introduced into the cylinder, which is graduated and placed over water. The iron is slowly shaken out of the basket, and when cold it is observed that one-fifth of the air has been absorbed.

II. Synthesis of sodium or potassium bromide. The metal is ground up with about 10 times its weight of sodium chloride or potassium bromide, and the powder thus obtained thrown into bromine vapour and well shaken until the colour of the bromine has disappeared. Sodium chloride may be synthesised by a similar method.

J. J. S.

Inorganic Chemistry.

Hydrogen Peroxide. By ARTHUR MARCUSE and RICHARD WOLFENSTEIN (*Ber.*, 1901, 34, 2430—2432).—See this vol., i, 608.

Oxides of Chlorine. By ALBERT REYCHLER (*Bull. Soc. Chim.*, 1901, [iii], 25, 659—665).—A 0.5—0.7 per cent. solution of chlorine peroxide can be prepared by allowing a dish containing potassium chlorate and slightly diluted sulphuric acid to float on water contained in a larger dish for a couple of hours, the whole being covered by a bell-jar.

On mixing solutions of equivalent quantities of chlorine peroxide and potassium hydroxide, the yellow colour of the peroxide slowly disappears; at the same time, the oxidising power (as estimated by titration with *N*/10 thiosulphate of the iodine set free from hydriodic acid) decreases, until it becomes constant; when the yellow colour is no longer visible. The reaction is thus represented: $2\text{ClO}_2 + 2\text{KOH} = \text{KClO}_2 + \text{KClO}_3 + \text{H}_2\text{O}$; a small amount of chlorine is liberated, which reacts with potassium hydroxide in the usual manner. When a large excess of potassium hydroxide is used, the yellow colour disappears and the titre becomes constant far more rapidly.

When solutions of chlorine peroxide and sodium peroxide are mixed, the yellow colour of the former immediately becomes fainter, and disappears as soon as a sufficient quantity of the latter has been added; at the same time, oxygen is evolved. The faintly alkaline colourless solution thus obtained is without action on indigo or iodised starch-paper, and becomes yellow on addition of acid. After acidification with acetic acid, it gives, with lead nitrate, a precipitate of the characteristic lead chlorite. Estimations of the oxygen evolved, and of the oxidising power of the solution, show that the reaction is represented by the equation: $2\text{ClO}_2 + \text{Na}_2\text{O}_2 = 2\text{NaClO}_2 + \text{O}_2$.

The author finds that the halogens react with solutions of sodium peroxide (containing sodium hydroxide), forming sodium haloid and oxygen; thus with iodine: $\text{Na}_2\text{O}_2 + \text{I}_2 = 2\text{NaI} + \text{O}_2$; at the same time, the sodium hydroxide forms hypoiodite and iodide. K. J. P. O.

Chlorine Peroxide as a Steriliser of Drinking Waters. By ALBERT REYCHLER (*Bull. Soc. Chim.*, 1901, [iii], 25, 665—669).—The author points out that the coke employed by A. Bergé (*Mem. Soc. ingénieurs civils de France*, 1900) to remove excess of chlorine peroxide from water which has been sterilised by means of it, has not this effect. To water from an artesian well, containing much calcium and magnesium hydrogen carbonates, a known quantity of chlorine peroxide was added; the titre with thiosulphate slowly decreased, owing to the reaction of the chlorine peroxide with the hydrogen carbonates to form chlorite and chlorate (compare previous abstract). Treatment with coke did not destroy the peroxide, but hastened the formation of chlorite and chlorate. Using small quantities of chlorine peroxide, after treatment with coke, the reaction of the peroxide with

neutral potassium iodide was not given; on acidification, the reaction of chlorite was very marked. With larger quantities of chlorine peroxide, after 3 hours' treatment with coke, a reaction was still given with neutral iodide.

K. J. P. O.

Mechanism of the Reaction on Oxidation by Gaseous Oxygen. By WILHELM MANCHOT and JOHANNES HERZOG (*Zeit. anorg. Chem.*, 1901, 27, 397—419. Compare Abstr., 1900, ii, 546).—I. The oxidation of cobaltous cyanide. The rate of absorption of gas was determined when a solution of cobaltous cyanide was shaken at constant temperature with oxygen. Assuming that the reaction is one of the first order, a satisfactory constant is obtained; towards the end of the reaction, however, a diminution of the constant is observed, and this is attributed to the disturbing effect of the hydrogen peroxide formed. The reaction is bimolecular, and what is measured is the rate of decomposition of water by cobaltous cyanide on the assumption that the atomic oxygen is at once converted into hydrogen peroxide. The oxygen is not absorbed with formation of cobalt superoxide, for then the reaction would necessarily be termolecular.

II. The oxidation of ferrous oxide. Similar observations with solutions of ferrous oxalate, tartrate, and citrate led to irregularities in the constants for the expression of a reaction either of the first or of the second order, but it was found that during the oxidation some oxygen was made active. Results obtained when arsenious acid was added to the solution to take up the active oxygen show that the reaction is of the first order, as a satisfactory constant was found. In auto-oxidation with ferrous oxide, no hydrogen peroxide is produced, and the simplicity of the reaction is not in agreement with the views of van't Hoff, Engler, and Haber on this process.

J. McC.

Formation of Active Oxygen by Ferrous Oxide. By WILHELM MANCHOT [with F. GLASER] (*Zeit. anorg. Chem.*, 1901, 27, 420—431. Compare Abstr., 1900, i, 300).—In order to ascertain the proportion of active oxygen produced to oxygen used in the oxidation of ferrous salts, experiments were made in which large quantities of arsenious acid were used (see preceding abstract). To avoid the direct oxidation of the arsenious acid, potassium carbonate was added to the solution, and it was found that the volume of oxygen absorbed was almost exactly equivalent to 1 atom per molecule of ferrous oxide present. This indicates that the ratio of oxygen used in oxidising to that made active is 1 : 1, and as no hydrogen peroxide is formed, it is probable that in the first place a superoxide, FeO_2 , is produced. By the oxidation of chromous salts with free oxygen, part of the gas is also made active. Experiments with manganese salts are in progress.

J. McC.

Hydrate of Sulphuryl Chloride and its Solution in Water without Change. By GIACOMO CARRARA (*Gazzetta*, 1901, 31, i, 450—452).—Replying to Baeyer and Villiger's criticisms (*Ber.*, 1901, 34, 736; this vol., ii, 311) on the work of Carrara and Zappellari (Abstr., 1894, ii, 412) on the velocity of decomposition of sulphuryl chloride by water, the author points out that in the condi-

tions under which the measurements were made, it is impossible for a hydrate of the chloride to be formed. The author considers that Baeyer and Villiger's work does not prove that sulphuryl chloride dissolves in water without at first undergoing some change.

T. H. P.

Studies on the Solubilities of Salts. VII. Telluric Acid and Allotelluric Acid. By FRANZ MYLIUS (*Ber.*, 1901, 34, 2208—2220).—Concentrated solutions of telluric acid, when supersaturated with sodium hydroxide, yield the *salt*, $\text{Na}_4\text{TeO}_5 \cdot 8\text{H}_2\text{O}$, which crystallises in slender, felted needles, and is hydrolysed by water to the salt $\text{Na}_2\text{TeO}_4 \cdot 2\text{H}_2\text{O}$. A corresponding *lithium* salt was also obtained. The solubility curves of the two hydrates $\text{H}_2\text{TeO}_4 \cdot 6\text{H}_2\text{O}$ and $\text{H}_2\text{TeO}_4 \cdot 2\text{H}_2\text{O}$ intersect at $+10^\circ$, the dihydrate being stable at higher temperatures. When ordinary telluric acid, $\text{H}_2\text{TeO}_4 \cdot 2\text{H}_2\text{O}$, is heated at 140° , it is converted into *allotelluric acid*, probably $(\text{H}_2\text{TeO}_4)_n$, which has a conductivity five times as great as telluric acid, and differs from it in giving white precipitates with solutions of guanidine carbonate and albumin; in aqueous solution, it is only slowly reconverted into telluric acid.

It is noted that extremely small quantities of telluric acid (less than 1 mg.), when taken internally, give to the breath a most offensive odour, probably due to the formation of tellurium methyl.

R. H. P.

Synthetical Formation of Ammonia. By E. BAUR (*Ber.*, 1901, 34, 2385—2391).—In the electrolysis of Divers' solution, that is, a solution of ammonia in a saturated solution of ammonium nitrate, nitrogen is evolved at the anode, and hydrogen at the cathode, in the proportion 1 : 3 by volume. The reaction by which the nitrogen is formed is expressed by the equation, $3\text{NO}_3 + 4\text{NH}_3 = \text{N} + 3\text{NH}_4\text{NO}_3$, whilst the hydrogen is formed by the decomposition, $\text{NH}_4 = \text{NH}_3 + \text{H}$.

When a galvanic element is constructed, using these two gases over Divers' solution, a current is obtained with an *E.M.F.* of about 0.6 volt, and the hydrogen and nitrogen respectively disappear from the positive and negative poles in the proportion of 3 : 1 by volume. A constant *E.M.F.* could only be obtained at -10° . When a 25 per cent. solution of ammonia in *N* potassium chloride was employed, no constant *E.M.F.* was observed.

When, however, the back *E.M.F.*, set up in the electrolysis of solutions of ammonia either in Divers' solution or in *N* potassium chloride was measured, constant values were found.

By the equation $E = E_0 + (RT/n\epsilon_0) \log \pi_0/\pi$, where E_0 = the observed *E.M.F.* at $-10^\circ = 0.59$ volt, and π_0 and π are respectively the vapour pressures of (liquid) ammonia and Divers' solution at temp. T , the value of the *E.M.F.* can be calculated for various temperatures; at 0° $E = 0.604$ volt, and at 15° , 0.627 volt. From the heat of formation of (liquid) ammonia at -10° , which equals 171.1 K , the temperature coefficient of the *E.M.F.* can be calculated, and is equal to 0.00125.

Failure attended all attempts to synthesise ammonia by passing nitrogen and hydrogen over platinum black at 100° , or over chromium

or molybdenum nitride, or by leaving the two gases over platinised platinum foil in the presence of hydrochloric acid. K. J. P. O.

Hydroxylamine Hydriodide. By RICHARD WOLFFENSTEIN and FRIEDRICH GROLL (*Ber.*, 1901, 34, 2417—2420).—The normal *hydriodide*, $\text{NH}_2\cdot\text{OH}\cdot\text{HI}$, which Dunstan and Goulding (*Trans.*, 1896, 69, 839) failed to prepare, is obtained by mixing molecular quantities of hydroxylamine and hydriodic acid in aqueous solution and evaporating in a vacuum, initially at 26° , and finally, to complete dryness, over phosphoric oxide at the ordinary temperature. It forms flat, colourless needles, is very hygroscopic, and decomposes explosively at $83\text{--}84^\circ$; it crystallises well from methyl alcohol.

The need is emphasised for greater caution in distilling hydroxylamine, owing to the frequent occurrence of dangerous explosions.

W. A. D.

Preparation of Phosphorus Oxychloride. By FRITZ ULLMANN and A. FORNARO (*Ber.*, 1901, 34, 2172—2173).—Directions are given for the preparation of phosphorus oxychloride by the oxidation of the trichloride with potassium chlorate. To avoid the formation of oxides of chlorine, the chlorate must be quite dry, and should be covered by a little previously obtained oxychloride before the trichloride is gradually added; under these conditions, the formation of the oxychloride proceeds quietly.

R. H. P.

Chemical Equilibria. Phosphoric Acid and Chlorides of the Alkaline Earths. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1901, 133, 5—20).—The author has investigated the acidity or alkalinity, to methyl-orange and phenolphthalein respectively, of mixtures of phosphoric acid or hydrogen phosphates with various proportions of chlorides of the alkaline earths, with and without various proportions of sodium hydroxide. Complete neutrality is rarely obtained with the exact proportions of the reacting substances corresponding with simple equations. In some instances, the establishment of equilibrium requires time, whilst, in others, the result depends on the length of time during which the precipitated phosphate and the liquid remain in contact. The quantity of alkaline earth required to neutralise 1 mol. of phosphoric acid varies from 2 to 4 equivalents, according to the conditions. Minute details of the various experiments are given.

C. H. B.

Studies of the Acids of Phosphorus. I. Velocity of Hydration of Metaphosphoric Acid. By CLEMENTE MONTEMARINI and U. EGIDI (*Gazzetta*, 1901, 31, i, 394—400).—The authors have measured the velocity of transformation of meta- into ortho-phosphoric acid in solutions of different concentrations at a temperature of $23\text{--}25^\circ$. The reaction, represented by the equation $\text{HPO}_3 + \text{H}_2\text{O} = \text{H}_3\text{PO}_4$ should be of the second order, but in dilute solutions the mass of water may be taken as constant, and the reaction as being of the first order. The results show that the velocity constant increases with the concentration of the solution employed, a fact which indicates that the ionic hydrogen present exercises a catalytic action on the reaction. Solutions of metaphosphoric acid hence keep better the more dilute and the more free from other acids they are. T. H. P.

Acidimetry of Arsenic Acid. By A. ASTRUC and J. TARBURIECH (*Compt. rend.*, 1901, 133, 36—38).—Arsenic acid, with methyl-orange as indicator, is monobasic to alkalis and alkaline earths at the ordinary temperature or in hot solutions. With phenolphthalein at the ordinary temperature, it is dibasic, but in hot solutions the colour change takes place after the addition of only $1\frac{1}{2}$ equivalents of an alkaline earth.

If in presence of a chloride of an alkaline earth metal excess of an alkali hydroxide is added to arsenic acid, a tribasic arsenate is precipitated, but if an acid is added until the liquid is neutral to phenolphthalein, this precipitate dissolves, and a dibasic arsenate is formed. If, however, the liquid is boiled, the first precipitate becomes crystalline, and afterwards does not dissolve when the liquid is neutralised. In this respect, arsenic acid behaves differently from phosphoric acid.

C. H. B.

Preparation of Thio-oxyarsenates. By WILLIAM HENRY McLAUCHLAN (*Ber.*, 1901, 34, 2166—2172).—Ammonium thio-oxyarsenate, $(\text{NH}_4)_3\text{AsO}_3\text{S}\cdot 4\text{H}_2\text{O}$, and *ammonium hydrogen thio-oxyarsenate*, $(\text{NH}_4)_2\text{HASO}_3\text{S}$, are obtained by the fractional precipitation by alcohol of an ammoniacal solution of a fused mixture of equal parts of arsenious trioxide and sulphur. The author has repeated the work of McCay (this vol., ii, 95), and of Weinland and Lehmann (this vol., ii, 313), and confirms McCay's interpretation of the results.

R. H. P.

Vitrified Quartz. By WILLIAM A. SHENSTONE (*Proc. Roy. Inst.*, 1901, Reprint).—When fragments of quartz, previously heated to 1000° , are thrown into cold water, a white, enamel-like product is obtained, which may be suddenly put into the hottest part of an oxy-hydrogen flame without splintering. Thus the fragments of silica may be fused together into rods, and from the latter tubes and vessels may be constructed. The vitrified silica is harder than felspar, but less hard than chalcodony; its density and refractive index are less than those of quartz. In transparency to ultra-violet rays, vitreous silica is superior to glass, and practically equal to air. Its rate of expansion is extremely small, and this explains its stability when exposed to sudden changes of temperature. Its high melting point should render it serviceable in thermometry and in investigations at high temperatures. Thus it has been shown that nitric peroxide is produced simply by heating a mixture of nitrogen and oxygen in tubes of silica to 1000° . Vitrified silica is, like platinum, slightly permeable to hydrogen at 1000° , and is attacked by hot basic oxides.

J. C. P.

An Acid Triple Salt. By WILHELM MEYERHOFFER and F. G. COTTRELL (*Zeit. anorg. Chem.*, 1901, 27, 442—444).—The salt, $\text{KHMg}(\text{SO}_4)_2 + 2\text{H}_2\text{O}$, is obtained by dissolving leonite, $(\text{MgSO}_4, \text{K}_2\text{SO}_4, 4\text{H}_2\text{O})$,

in 85 per cent. nitric acid and allowing the mixture to crystallise. It separates in prismatic, double-refracting crystals, and when treated with water is converted into picromerite, $\text{MgSO}_4, \text{K}_2\text{SO}_4 + 6\text{H}_2\text{O}$.

E. C. R.

Magnesium Aluminate. By ÉMILE DUFAU (*Bull. Soc. Chim.*, 1901, [iii], 25, 669—670).—Magnesium aluminate, spinel, MgAl_2O_4 , can be easily prepared by heating a mixture of alumina and magnesia in an electric furnace for a few minutes. The powdered mass is extracted with hot nitric acid, which leaves a mixture of carbon and the aluminate, the latter as colourless crystals. Separation is effected by projecting the mixture into methylene iodide. The aluminate, thus prepared, forms colourless octahedra, with a sp. gr. 3·57 at 15°, and is fusible only in the electric furnace. It is slowly attacked by hydrofluoric, hydrochloric, or sulphuric, but not by nitric, acid. Fluorine is without action at the ordinary temperature, but acts on it when heated. Chlorine, bromine, and iodine have no action, whilst sulphur only slowly acts at the temperature of molten glass. Carbon does not reduce the aluminate, but fused alkalis dissolve it easily.

One or two per cent. of coloured oxides give to the aluminate the colours of the different varieties of spinel. No other magnesium aluminate could be obtained by varying the proportion of magnesia and alumina.

K. J. P. O.

Cadmium Suboxide. By SIMEON M. TANATAR (*Zeit. anorg. Chem.*, 1901, 27, 432—436).—*Cadmium suboxide*, Cd_4O , is obtained more easily than lead suboxide (this vol., ii, 451) by cautiously heating cadmium oxalate in a current of dry carbon dioxide. It is a green, amorphous powder, decomposes when treated with acids or ammonia into cadmium oxide and metallic cadmium, is slowly decomposed by water, and is stable in dry air; its sp. gr. is 8·177 to 8·207 at 19°.

When the suboxide is heated to the melting point of cadmium in a current of carbon dioxide, it is converted into a yellowish-brown powder which is a mixture of metallic cadmium and cadmium oxide.

E. C. R.

Bismuth Suboxide. By SIMEON M. TANATAR (*Zeit. anorg. Chem.*, 1901, 27, 437—441).—*Bismuth suboxide*, BiO , is easily obtained by heating the oxalate, $\text{Bi}_2\text{O}_3(\text{C}_2\text{O}_4)_2$, in a current of carbon dioxide. It is a black powder, stable in the air, is slowly decomposed by water, reduces Fehling's solution and potassium permanganate, and, on heating, is converted into yellow bismuth oxide; its sp. gr. is 7·153 to 7·201 at 19°. When heated above the melting point of bismuth in a current of carbon dioxide, it is converted into a grey mixture of bismuth oxide and metallic bismuth.

The oxalate, $\text{Bi}_2\text{O}(\text{C}_2\text{O}_4)_2$, when heated in a current of dry carbon dioxide, yields a mixture of the suboxide and metallic bismuth, sp. gr. 8·356 at 19°. This product gives the same chemical reactions as the suboxide, but is shown to be a mixture by measuring the heat evolved on dissolving it in acids (this vol., ii, 451).

E. C. R.

Solubility of Manganous Sulphate. By THEODORE W. RICHARDS and FRANK ROY FRAPRIE (*Amer. Chem. J.*, 1901, 26, 75—80. Compare Cottrell, this vol., ii, 12).—The solubility of the pentahydrate of manganous sulphate is 65·19 per cent. at 25°, whilst that of the tetrahydrate is 66·38 at 30·15° and 68·22 per cent. at 35°, the figures in each case representing the number of grams of the anhydrous salt in 100 grams of the solution. These results confirm those of Cottrell, and disprove

those of Linebarger (Abstr., 1893, ii, 417). It was found that manganous sulphate retains traces of water even after being heated for half an hour at 350° , but that at 450° the whole is expelled.

E. G.

Manganic Phosphates. By VICTOR AUGER (*Compt. rend.*, 1901, 133, 94—96).—A *manganic pyrophosphate*, $\text{Mn}_4\text{P}_6\text{O}_{21}\cdot 14\text{H}_2\text{O}$, is obtained by fusing manganese nitrate with phosphoric acid at 210° , extracting the fused mass with water, and adding alcohol to the violet-coloured extract; the salt separates as a buff-coloured, crystalline precipitate which loses $10\text{H}_2\text{O}$ at 185° , and the remaining $4\text{H}_2\text{O}$ at 440° . Cold solutions of alkalis extract phosphoric acid, which appears in solution as a pyrophosphate. Sulphuric acid dissolves it with a violet colour, which becomes red on dilution. Cold phosphoric acid dissolves it; from the violet solution which becomes rapidly colourless, the phosphate $\text{MnPO}_4\cdot \text{H}_2\text{O}$ separates. The preparation of manganic metaphosphate, MnP_3O_9 , is also described (compare Hermann, *Ann. Phys. Chem.*, 1858, 105, 289).

K. J. P. O.

Behaviour of an Iron Cathode in a Solution of Ammonium Nitrate. A New Ferrous Ferric Oxide. By A. KAUFMANN (*Zeit. Elektrochem.*, 1901, 7, 733—741).—When a solution of ammonium nitrate, saturated at 0° , is electrolysed in a cell containing a porous diaphragm, a carbon anode and an iron cathode, with a cathodic current density of 0.00002 ampere per sq. cm., the iron dissolves, forming a golden-yellow solution. When this solution is heated in absence of air, a black, amorphous, magnetic oxide of iron is precipitated. The yellow solution contains ferrous ammonium nitrate, and may be prepared by treating finely divided iron with a concentrated ammoniacal solution of ammonium nitrate. Similar solutions are obtained with other ammonium salts, the more concentrated the solution and the higher the temperature the better are the results obtained. The iron exists in the ferrous ammonium nitrate solution as a complex cathion.

The new oxide of iron has the composition $2\text{FeO}\cdot 3\text{Fe}_2\text{O}_3$; it is bluish-black, which distinguishes it from the brownish-black magnetic oxide, Fe_3O_4 . It is best prepared by dissolving crystallised ferrous sulphate (21 grams) in water (220 grams) and 20 per cent. ammonia (22 grams) and boiling, after which potassium nitrate (2.55 grams) is added in portions and the boiling continued for 15 minutes.

T. E.

Electrochemical Formation of Alkali Ferrates. By WAL-DEMAR PICK (*Zeit. Elektrochem.*, 1901, 7, 713—724).—Full details of the experiments described by Haber and Pick (this vol., ii, 103). When iron, especially one of the purer kinds, is used as anode in a solution of an alkali hydroxide, a temporary formation of ferrate occurs; by reversing the current for a short time after the formation of ferrate has ceased, the iron returns to the condition in which it can be oxidised to ferrate, and after several repetitions of the treatment this condition becomes permanent. The same result is obtained by using the iron as anode in a concentrated solution of an alkali hydroxide and passing a very small current for some time. The iron is

found to be covered by a dark grey skin which prevents atmospheric oxidation. T. E.

Ferrite Solutions. By FRITZ HABER (*Zeit. Elektrochem.*, 1901, 7, 724—726).—Details of the methods used to prove that the liquid obtained by boiling a solution of sodium ferrate contains a compound of ferric oxide, Fe_2O_3 (see this vol., ii, 103). T. E.

Simultaneous Deposition of Iron and Nickel from Mixed Solutions of their Sulphates. By FRIEDRICH W. KÜSTER (*Zeit. Elektrochem.*, 1901, 7, 688—692).—The smallest *E.M.F.* which will cause deposition of nickel from a solution of nickel sulphate is about 0.1 volt less than that required to deposit iron from a solution of ferrous sulphate, when platinum point cathodes are used. From solutions containing both salts, nickel alone is deposited when the applied *E.M.F.* is just sufficient to produce deposition of nickel from a solution of nickel sulphate, but iron begins to be deposited at a point midway between the deposition points of nickel and iron, and the proportion of iron in the deposit rapidly increases with the *E.M.F.* used. A deposit containing 75 per cent. of iron is obtained from a solution containing equal quantities of iron and nickel, and this composition is almost independent of the *E.M.F.* between fairly wide limits. When working with sensible currents, therefore, iron is deposited more rapidly than nickel, although it requires a larger *E.M.F.* The author suggests that, although the magnitude of the force producing a chemical change may determine it when the velocity is very small, yet at sensible velocities (as Nernst pointed out) a kind of chemical Ohm's law may determine the velocity (velocity = chemical force/chemical resistance) so that the velocity of deposition of iron might exceed that of nickel, although the driving force were less. T. E.

Cobalt and Nickel Iodates and their Solubility in Water. By A. MEUSSER (*Ber.*, 1901, 34, 2432—2442).—Cobalt iodate crystallises from water in three forms: in the anhydrous state, with $2\text{H}_2\text{O}$ and with $4\text{H}_2\text{O}$ respectively; the trihydrate, pentahydrate, and hexahydrate could not be obtained (compare Clarke, *Abstr.*, 1878, 377, and Ditte, *Abstr.*, 1892, 1388). The tetrahydrate, $\text{Co}(\text{IO}_3)_2 \cdot 4\text{H}_2\text{O}$, forms red crusts of six-sided needles. The dihydrate, $\text{Co}(\text{IO}_3)_2 \cdot 2\text{H}_2\text{O}$, was probably obtained by Rammelsberg (*Ann. Phys. Chem.*, 1838, 44, 562) in an impure form. A table and curves of solubilities are given, showing the variation of solubility of the three forms with changing temperature; at 18° , 0.038 mol. of the tetrahydrate, 0.020 mol. of the dihydrate, and 0.046 mol. of the anhydrous salt are soluble in 100 mols. of water. The solubility of the tetrahydrate increases rapidly with the temperature, the rate of increase becoming greater at higher temperatures; the solubility of the anhydride diminishes with rising temperature, whilst that of the dihydrate increases in nearly direct proportion.

The author differs from Rammelsberg, Clarke, and Ditte with regard to the hydrates of nickel iodate, being able to isolate only the anhydrous form, two dihydrates, and a tetrahydrate. The *tetrahydrate*, $\text{Ni}(\text{IO}_3)_2 \cdot 4\text{H}_2\text{O}$, forms green, six-sided prisms and loses water, iodine,

and oxygen below 100° . The α -dihydrate forms a crust of greenish crystals, and the β -dihydrate short, lustrous prisms. The anhydrous salt forms microscopic needles, which, in transmitted light, are colourless, but as a powder appears yellow in reflected light.

Curves and tables of solubilities are given for various temperatures, 0.063 mol. of the tetrahydrate, 0.039 mol. of the α -dihydrate, 0.050 mol. of the anhydrous salt dissolve in 100 mols. of water at 30° ; the β -dihydrate is much less soluble than the α -dihydrate. W. A. D.

Electrolysis of Uranium Nitrate. By WILLIAM OECHSNER DE CONINCK and CAMO (*Bull. Acad. Roy. Belg.*, 1901, 321—322. Compare this vol., ii, 104, 105, 164, 165, 390).—The electrolysis of 6—8 per cent. solutions of uranium nitrate yields the black, pulverulent, pyrophoric protoxide; this, when dried in a water-oven, is converted into the orange-coloured hydrate, $U_2O_3 \cdot H_2O$, of the sesquioxide. With a weaker current, the canary-yellow hydrate, $U_2O_3 \cdot 2H_2O$, and the orange-coloured hydrate, $U_2O_3 \cdot H_2O$, are formed. With some solutions, a current of about 1 ampere gives a mixture of the yellow and orange hydrates; with others, the black oxide, U_4O_9 , is obtained, along with one of its hydrates which is violet. The latter in a dry atmosphere slowly changes into the yellow hydrate. The black oxide, U_4O_9 , is very stable, and is thus distinguished from the protoxide; it does not oxidise at 100° , and when strongly heated in hydrogen is reduced to the protoxide.

When solutions of uranium nitrate containing traces of nitric acid are electrolysed, a precipitate is not formed, owing to the oxides initially produced dissolving in the acid present. W. A. D.

Preparation of pure Antimony Hydride. By ALFRED STOCK and WALTHER DOHT (*Ber.*, 1901, 34, 2339—2344).—Pure antimony hydride can be prepared by condensing the dried mixture of antimony hydride and hydrogen (obtained by treating powdered antimony-zinc alloy containing 25 per cent. of antimony with dilute acid) in a U-tube surrounded with liquid air. Pure antimony hydride condenses to a colourless liquid, has a faint smell resembling that of hydrogen sulphide, is decomposed by air, but is not changed by light or moisture. R. H. P.

New Treatment of Niobite: Preparation and Properties of Fused Niobium. By HENRI MOISSAN (*Compt. rend.*, 1901, 133, 20—25).—Niobite was heated with carbon in the electric furnace for 7 or 8 minutes with a current of 1000 amperes and 50 volts, and gave a regulus containing niobium and tantalum, with 2.18 to 2.34 per cent. of combined carbon, but no graphite. The alloy was converted into potassium fluotantalate and potassium fluoxyniobate, which were separated by crystallisation, and the fluoxyniobate was converted into niobium pentoxide. The latter, when heated with carbon in the electric tube furnace with a current of 600 amperes and 50 volts, yields fused niobium, which is somewhat hard, and readily scratches glass and quartz. Its melting point is higher than 1800° . The powdered metal becomes incandescent in fluorine at the ordinary temperature and in chlorine at about 205° , and is attacked by bromine at a somewhat higher temperature, but not by iodine at the softening point of glass. In oxygen at about 400° or air at a higher

temperature, it burns, and yields niobic pentoxide, but sulphur vapour acts superficially only at 600° , and selenium and tellurium have no action at this temperature. Nitrogen, phosphorus, arsenic, and antimony do not act on niobium at 500 – 600° , but nitrogen forms a yellow nitride at 1200° . When in a state of fusion, the metal combines slowly with carbon, but even when the latter is in excess, a regulus containing graphite is not formed. Hydrogen chloride is decomposed by powdered niobium at a dull red heat, but water vapour and hydrogen sulphide are not decomposed even at 600° , whilst at a red heat ammonia is simply decomposed into nitrogen and hydrogen. Sulphur dioxide is reduced with incandescence at about 600° , and nitrous oxide, nitric oxide, phosphoric oxide, and carbon dioxide are reduced at a dull red heat. Iodine and arsenic pentoxides are reduced at a somewhat lower temperature. When fused with niobium, chromic oxide is reduced and a brittle alloy of niobium and chromium formed. Fused oxidising agents readily attack niobium, but ordinary acids are without action, with the exception of hydrofluoric acid and hot concentrated sulphuric acid, and even these act very slowly. Niobium does not form alloys with sodium, potassium, magnesium, or zinc, but at its melting point it takes up small quantities of iron. C. H. B.

Recovery of Platinum from Platinum Residues. By ADOLF BERTHOLD (*Zeit. angew. Chem.*, 1901, 14, 621–622).—Any deposit is collected on a filter, dissolved in nitro-hydrochloric acid, and the solution evaporated to dryness; the residue is then dissolved in hot water and added to the main filtrate. After adding hydrochloric acid, some zinc dust is introduced, and when the liquid has become colourless, it is carefully poured off from the precipitated platinum black. This is washed first with boiling hydrochloric acid and then repeatedly with boiling water, first by decantation, and then in a weighed Gooch crucible. To completely remove the last traces of potassium, it is ignited, again washed with boiling water until free from chlorine, dried, ignited, and weighed. Finally, it may be converted into platinum chloride solution of known strength. L. DE K.

Mineralogical Chemistry.

Analysis of supposed Italian Bauxites. By CARLO FORMENTI (*Gazzetta*, 1901, 31, i, 452–455).—The author has analysed four samples of supposed bauxite found in Italy, and finds that, although the main constituents are the same as in bauxite, the relative proportions of them are widely different. The samples cannot even be considered as representing poor bauxites, and could not be used for the profitable extraction of aluminium compounds. T. H. P.

Liveingite, a new Mineral from the Binnenthal. By RICHARD HARRISON SOLLY, with analysis by HENRY JACKSON (*Proc. Camb. Phil. Soc.*, 1901, 11, 239—240).—In general appearance this new mineral resembles the several other sulpharsenites of lead which occur in the white dolomite of the Binnenthal in Switzerland. The crystals are oblique, with pseudo-rhombic habit; in the prism zone they have the angles of sartorite ($\text{PbS}, \text{As}_2\text{S}_3$), and in the dome zone the angles of rathite ($3\text{PbS}, 2\text{As}_2\text{S}_3$). The two individuals of the twinned crystals have respectively a red and a green tarnish on the surface. The following analytical results give the formula $4\text{PbS}, 3\text{As}_2\text{S}_3$:

Pb.	As.	S.	Fe.	Total.
47.58	26.93	24.91	trace	99.42.

L. J. S.

Manganese Ore Deposits of Queluz, Brazil. By ORVILLE A. DERBY (*Amer. J. Sci.*, 1901, [iv], 12, 18—32).—The manganese ores of the Queluz (Lafayette) district in Minas Geraes occur over a wide area in granitic and gneissic rocks, and are intimately associated with rocks composed wholly or largely of manganese garnet (spessartite). It is shown that the black manganese oxides forming the ore have been derived by the alteration of this garnet. Detailed descriptions are given of the mode of occurrence of the ores, and analyses are given of the garnet rock.

L. J. S.

Synthesis of Boronatrocalcite (Ulexite). By AUGUST B. DE SCHULTEN (*Compt. rend.*, 1901, 132, 1576—1577).—This mineral is prepared artificially by adding a solution of calcium chloride to a large excess of a saturated solution of borax, and allowing the mixture to remain in a closed vessel for 15 to 30 days. At the end of this time, the amorphous precipitate is entirely transformed into acicular crystals, but these are too minute for optical and crystallographical examination. Analysis of this crystallised material gave the same formula as that adopted for the mineral ulexite, namely, $\text{Na}_2\text{O}, \text{CaO}, 5\text{B}_2\text{O}_3, 16\text{H}_2\text{O}$. The crystals are slowly dissolved by cold water. Sp. gr. 1.955. L. J. S.

Brushite from the Island of Mona, West Indies. By CARL KLEIN (*Sitz.-ber. Akad. Wiss. Berlin*, 1901, 720—725).—Wax-yellow crystallised brushite with a perfect cleavage in one direction, occurs in the guano deposits of the island of Mona near Porto Rico. Sp. gr. 2.28. Analysis by Finkener gave

CaO.	P ₂ O ₅ .	SO ₃ .	H ₂ O.	Total.	H ₂ O at 130°.
30.83	37.96	0.49	30.88	100.16	25.17

Deducting a little gypsum or anhydrite, this gives the formula $2\text{HCaPO}_4, 5\frac{1}{2}\text{H}_2\text{O}$; the mineral thus appears to differ from brushito ($2\text{HCaPO}_4, 4\text{H}_2\text{O}$) in containing more water, and for this reason the name *stoffertite* is provisionally proposed for it. Crystallographical and optical determinations are given, and those of Lacroix (*Abstr.*, 1897, ii, 505) discussed.

L. J. S.

Crystallisation of Complex Salt Solutions with particular reference to Oceanic Salt Deposits. By JACOBUS H. VAN'T HOFF (*Zeit. angew. Chem.*, 1901, 14, 531—537).—A solution of sodium and

potassium chlorides when evaporated at 25° deposits the excess of one of the salts until the concentration of the solution with respect to NaCl and KCl respectively is 89 and 39 mols. per 1000 mols. of water. The deposit thereafter has the same composition as the solution, and a mixture in these proportions is the ultimate product of the evaporation.

With magnesium and potassium sulphates, the first depositions take place in such a way as to leave a solution containing 38 mols. of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ and 14 mols. of picromerite per 1000 mols. of water and

Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$).		
Chloromagnesite ($\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$)		
Kieserite ($\text{MgSO}_4 \cdot 6 - \frac{5}{4}\text{H}_2\text{O}$)		Carnallite ($\text{MgCl}_2 \cdot \text{K} \cdot 6\text{H}_2\text{O}$)
Epsomite ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$)	Kainite ($\text{MgSO}_4 \cdot \text{KCl} \cdot 3\text{H}_2\text{O}$)	Sylvite (KCl)
Blödite (SO_4) ₂ Mg Na ₂ · 4H ₂ O	Leonite [$\text{MgK}_2(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$]	
	Picromerite [$\text{MgK}_2(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$]	
Thenardite (Na_2SO_4).	Aphthalite [$\text{K}_3\text{Na}(\text{SO}_4)_2$]	
Glauberite [$\text{CaNa}_2(\text{SO}_4)_2$].		Syngenite [$\text{CaK}_2(\text{SO}_4)_2 \cdot \text{H}_2\text{O}$].

this mixture then separates out. It is important to notice that in these considerations it is supposed that the deposit is removed from contact with the solution, a condition which is practically attained in the natural deposition, since the formation of crust prevents the action of the solution on the lower layers.

With potassium chloride and magnesium sulphate double decomposition takes place and the following may deposit: potassium sulphate, sylvite, picromerite, magnesium sulphate (hepta- and hexa-hydrates), carnallite, and magnesium chloride. During the deposition, the

composition of the solution alters so as to approach that represented by 2 mols. of $\text{MgSO}_4 \cdot 6\text{H}_2\text{O}$, 12 mols. of $\text{MgCl}_2 \cdot \text{K}_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$, and 99 mols. of $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ per 1000 mols. of water and the solution then dries, leaving a mixture of these in the proportions given.

If to the last mixture sodium chloride be also added, then the following may separate from the solution: magnesium chloride, sylvite, thenardite, magnesium sulphate (with 7, 6, 5, or $4\text{H}_2\text{O}$), picromerite, leonite, blödite, aphthitalite, kainite, and carnallite. The final deposit in this case is also a mixture of carnallite, $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$, and $\text{MgSO}_4 \cdot 6\text{H}_2\text{O}$.

When calcium salts are also present then depositions of the following may also take place: gypsum, anhydrite, glauberite, syngenite, and tachhydrite, but this case has not yet been exhaustively investigated.

Assuming that the natural deposition takes place at 25° , the scheme on p. 559 represents (1) 14 minerals which may occur along with sodium chloride, (2) minerals which occur together (contiguous fields).

Thus carnallite may occur with sylvite, but not with aphthitalite; syngenite with sylvite; glauberite with blödite, &c.

J. McC.

[Albite in] Green Schist from Piedmont. By HEINRICH PREISWERK (*Centr. Min.*, 1901, 303—308).—Chlorite- and amphibole-schists, which have been derived from diabases, are of general distribution, and a usual constituent of such rocks is a colourless, perfectly fresh felspar usually recognisable only as a mosaic under the microscope. A green schist at Brusson, Piedmont, contains large crystals of this felspar in association with chlorite, hornblende, epidote, zoisite, &c. Analysis of the felspar (sp. gr. 2.652—2.636) by W. Forsberg gave:

SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	K_2O	Na_2O	Total.
64.81	20.13	0.21	1.29	0.45	0.68	11.65	99.22

This indicates a close approach to albite; and specially selected fragments of pure material were found to contain no calcium. Optical determinations also point to the material being nearly pure albite.

L. J. S.

A Mineral from Casal Brunori, near Rome. By FERRUCCIO ZAMBONINI (*Centr. Min.*, 1901, 397—401).—In a few cavities in the lava at this locality was found a greenish-yellow, woolly substance in association with calcite. Under the microscope, it is seen to consist of an aggregate of short rods, of which the optical extinction is straight. The following analysis of this material gives the formula $\text{RO} \cdot \text{R}_2\text{O}_3 \cdot 3\text{SiO}_2 \cdot 7\text{H}_2\text{O}$; it therefore appears to be identical with the Scotch chlorophæite:

SiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	$\text{K}_2\text{O}, \text{Na}_2\text{O}$	H_2O	Total.
37.86	13.54	13.33	trace	6.27	2.65	26.12	99.77

L. J. S.

Asbestos from Alilovci, District of Sauskimost. By JOH. GRIMMER (*Geol. Centr.*, 1901, 1, 386; from *Wiss. Mitth. aus Bosnien u. d. Herzegovina*, 1899, 6, 887—889).—The asbestos mined at this locality surrounds and penetrates blocks of limestone of Permian age. There are no amphibole or serpentine rocks in the immediate vicinity, although the latter are found five kilometres west of Alilovci. Analysis by L. Scheiders gave the results under I; Analysis II, by S. Bošnjaković, is of less pure material after being digested with hydrochloric acid and air-dried.

	SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	MgO.	CaO.	K ₂ O.	Na ₂ O.	CO ₂ .	H ₂ O.	Total.
I.	54.10	—	15.76	7.33	12.60	1.44	0.45	5.40	0.09	2.81	99.98
II.	52.35	5.47	15.36	—	10.39	—	4.37	—	—	10.25	98.19

L. J. S.

Analysis of Travertine from Vichy. By C. GIRARD and FRED. BORDAS (*Compt. rend.*, 1901, 132, 1423—1426).—Analyses are given of three samples of travertine (calcareous tufa) deposited by the mineral water at Vichy. The material is dirty yellow, and compact or ochreous. It consists mainly of calcium carbonate (91.709—97.169 per cent.), with small amounts of carbonates of magnesium, sodium, potassium, manganese and iron, sodium phosphate, aluminium sulphate, magnesium sulphate, ferric arsenate (trace—0.342 per cent.), silica and insoluble residue, together with traces of copper, barium, lithium and chlorine.

L. J. S.

Physiological Chemistry.

Digestive Power of Gastric Juice. By ALBERT FROUIN (*Compt. rend. Soc. Biol.*, 1901, 53, 590—593).—Variation in the digestive power of gastric juice depends chiefly on the amount of hydrochloric acid. Proteid food increases the secretion of pepsin. W. D. H.

Amylolytic Action of Saliva. By P. BIELFELD (*Zeit. Biol.*, 1901, 41, 360—367).—The amount of ptyalin has no influence on the quantity of sugar formed. The percentage amount of starch in the original solution is also unimportant. The important factor is the absolute quantity of starch; the greater the amount of starch, the greater is the amount of sugar formed. The estimations of sugar were made by Pavy's method. The polarimetric method is inaccurate on account of the high optical activity of the dextrins formed.

W. D. H.

Quantitative Action of Pepsin. By FRIEDRICH KRÜGER (*Zeit. Biol.*, 1901, 41, 378—392).—Maszewski (this vol., i, 178) and Biefeld (see preceding abstract) have independently pointed out that in connection with ptyalin, the amount of ferment present is of little or no importance. Quantitative estimations of ptyalin and other ferments hitherto published are therefore to be regarded with suspicion. It

is important, however, to ascertain whether the same law holds for other ferments, and the present research relates to pepsin. There are differences between pepsin and ptyalin. In the case of pepsin, the amount of proteolytic products increases with the amount of pepsin, but not proportionately. The activity of pepsin increases with decrease in the concentration of the original proteid solution, but not proportionately; the most important factor, however, as in the case of ptyalin, is the total amount of proteid present. W. D. H.

Lipase. By MAURICE HANRIOT (*Compt. rend. Soc. Biol.*, 1901, 53, 369).—By fractional precipitation of serum with ammonium sulphate, iron and lipase are found in the first portion of the precipitate. If zinc powder is added to serum, ferric salts are reduced to ferrous, and the power of the lipase is lessened; this, however, returns by agitation with air. The action of lipase is inhibited by acids and restored by alkalis; this is explained by supposing that the acid displaces the iron with which the lipase is in combination. W. D. H.

Intracellular Digestion and Enzymes in Actiniæ. By FÉLIX MESNIL (*Ann. Inst. Pasteur*, 1901, 15, 352—397).—The fluid in the cœlenteric cavity of *Actiniæ* has no digestive action. Digestion is accomplished in the same cells as those which form the ferments. By destroying the cells, the enzymes may be extracted. These are of various kinds, proteolytic, rennin-like, diastatic, and hæmolytic, and although intracellular, they obey the same laws as extracellular ferments. W. D. H.

Cause of the Increase of Proteid Decomposition during Inanition. By FRIEDRICH N. SCHULZ (*Zeit. Biol.*, 1901, 41, 368—377).—Polemical; mainly directed against Kaufmann (this vol., ii, 254). W. D. H.

Absorption of Fat. By EDOUARD PFLÜGER (*Pflüger's Archiv*, 1901, 86, 1—46).—One hundred c.c. of fresh ox-bile dissolve 4 or 5 grams of oleic acid; the amount rises to more than 10 grams when an equivalent amount of sodium hydroxide is also added. On being warmed to 37° for a day, 17 to 19 per cent. of the fatty acid is saponified. Bile does not accelerate the saponification of oleic acid by soda. If stearic acid is warmed to 37° for 4 to 5 days with sodium hydroxide, there is no trace of saponification, but if oleic acid is also added, saponification goes on rapidly, and this is much more marked on the addition of bile. If 100 c.c. of bile are mixed with 10 grams of stearic and 10 grams of oleic acid and an equivalent amount of dilute sodium hydroxide solution, about 15 grams of fatty acid are brought into a condition which is soluble in water. Neutral soaps dissolved in water are precipitated by the addition of much water, and free fatty acid is liberated; thus soaps undergo hydrolytic dissociation. During fat absorption, the reaction of the contents of the small intestine is sometimes acid, sometimes alkaline. W. D. H.

Action of Alcohols on the Arterial Blood Stream. By HANS BUCHNER, F. FUCHS, and L. MEGELE (*Arch. Hygiene*, 1901, 40, 347—374).—Methyl alcohol is a stronger, and *n*-propyl alcohol a much stronger

antiseptic than ethyl alcohol. The beneficial effect of alcohol bandages cannot, however, be explained by germicide action, for only traces of the alcohol penetrate the skin. The alcohol stimulates the skin, dilates the vessels locally, increases the flow of blood through the deeper tissues, and so confers on them greater resistance to infective agents.

W. D. H.

Formation of Lactic Acid in the Blood. By LEON ASHER and HOLMES C. JACKSON (*Zeit. Biol.*, 1901, 41, 393—436).—Katabolic processes are not qualitatively different in artificial transfusion, and under normal conditions. The formation of lactic acid is related to proteid decomposition in the cells, and it does not apparently originate from dextrose. Incomplete oxidation of carbohydrate owing to lack of oxygen is not the cause of the formation of lactic acid.

W. D. H.

A new Reducing Substance in the Blood. By PAUL MAYER (*Zeit. physiol. Chem.*, 1901, 32, 518—530).—Ox-blood contains a glycuronic acid compound as a normal constituent. This substance is a reducing agent and yields an osazone which melts at 159—164°. The existence of this substance will probably explain some of the results obtained by Pavy and Siau (this vol., ii, 257); possibly the osazone they found which melts at 157°, and which they consider is derived from isomaltose, in both blood and diabetic urine is really derived from glycuronic acid. Glycuronic acid increases in the urine in diabetes.

W. D. H.

Sugar Formation after administration of Proteids. By ERNST BENDIX (*Zeit. physiol. Chem.*, 1901, 32, 479—503).—By feeding dogs, freed from glycogen, on proteids, and subsequently administering phloridzin and estimating the sugar/nitrogen quotient, it was found that as much or more sugar was produced when the proteid given was casein or gelatin as when egg-albumin was given. In other experiments, the glycogen in the animal's body was estimated, and here again glycogen was formed abundantly on a proteid diet, even when the proteid was one like casein or gelatin, which contains no carbohydrate radicle.

W. D. H.

A Glycolytic Enzyme in Muscle. By SIR T. LAUDER BRUNTON and HERBERT RHODES (*Proc. Roy. Soc.*, 1901, 68, 323—326).—Glycerol extracts of muscle are slightly glycolytic in relation to dextrose. Muscle juice squeezed out at high pressure is more so. This power is destroyed by boiling, and is not due to bacteria. Attempts were made to isolate the enzyme by precipitation with alcohol, but without success.

W. D. H.

Chemical Nature of the Tissues. By ALEXANDRE ÉTARD (*Ann. Inst. Pasteur*, 1901, 15, 398—408).—Protoplasm of any origin contains a proteid substance termed *protoplasmide*, in which about 16 per cent. of nitrogen is present.

When treated with sulphuric acid, the bone tissue, freed from calcium salts, yields various hydrolytic products, amongst which are glycine and leucine.

R. H. P.

Immunity in relation to the Pancreas and its Ferments. By GEORGE DEAN (*Trans. Path. Soc.*, 1901, 52, 127—131).—Experi-

ments were made by subcutaneously injecting tryptic solutions in goats. The results show that an increase over the normal antitryptic action of the serum can be obtained by a process of immunisation. The increase is not a great one, and there is no enormous accumulation of the anti-compound in the blood, as in the case of bacterial anti-toxins. Ehrlich's explanation of the failure to obtain anti-remmin of great strength seems to be applicable to antitrypsin. W. D. H.

Active Principle of the Suprarenal Gland. By T. B. ALDRICH (*Amer. J. Physiol.*, 1901, 5, 457—461).—Takamine (*Therap. Gaz.*, 1901, 221) has separated the active principle from suprarenal glands, and named it *adrenalin*. 0.000001 gram per kilo. of body weight raises the blood pressure. The present author has independently prepared the same substance by another method, and obtained it in a crystalline form. Its formula is $C_9H_{13}O_3N$. Abel's epinephrin is possibly a benzoyl derivative of it. W. D. H.

Elimination of Sodium Salicylate by the Bile. By GEORGES LINOSSIER (*Compt. rend. Soc. Biol.*, 1901, 53, 365—367).—In three experiments on dogs dosed with sodium salicylate, the drug was estimated in blood, liver, bile, and urine. The amount in the urine exceeded that in the bile in two experiments, in the third there was more in the bile. The amount in the bile is insufficient to exert any antiseptic action. W. D. H.

Non-permeability of the Wall of the Urinary Bladder. By OTTO COHNHEIM (*Zeit. Biol.*, 1901, 41, 331—340).—In the intestinal wall, the stream of liquid is in one direction only; in the peritoneum, diffusion resembles that which occurs through parchment paper. In the urinary bladder, the liquid contained within it alters no more than it would in a glass vessel. The bladder wall is not a diffusion membrane, or a semipermeable membrane, and is not permeable to water. These differences furnish evidence of the 'physiological component' in the movement of liquid through living animal membranes. As soon as these three membranes are poisoned with sodium fluoride, the differences between them disappear, and they all behave like diffusion membranes. W. D. H.

Rôle of Leucocytes in Excretion. By HENRY STASSANO (*Compt. rend.*, 1901, 133, 110—113).—Leucocytes, like endothelial cells, are capable of ingesting and incorporating with themselves many poisonous materials, both inorganic and organic. They also assist elimination by discharging such compounds combined with nucleo-proteid into the blood plasma, excretion being finally performed either in the intestinal or renal tract. Narcotics lessen diapedesis, but not the capacity of absorption of the leucocytes. W. D. H.

Action of Currents of high frequency on the Secretion of Urine. By DENOYÉS, MARTRE, and ROUVIÈRE (*Compt. rend.*, 1901, 133, 64—67).—Currents of high frequency applied for a short time (10—25 minutes) daily increase the quantity of urine, urea, uric acid, and inorganic salts secreted daily. This increase lasts to a less degree for the three days following the treatment. Experiments with analytical tables are given for three individuals. W. D. H.

'Organic Chlorine' in the Urine. By JULES VILLE and JOSEPH MOITESSIER (*Compt. rend. Soc. Biol.*, 1901, 53, 673—675).—Although the precipitation of small quantities of chlorides by silver nitrate may be prevented by the presence of urea and other extractives of the urine, there is no evidence of the existence of organic chlorine compounds in the urine.
W. D. H.

Variations in the Excretion of Nitrogen and Chlorides during Insufficient Nutrition. By ADOLPHE JAVAL (*Compt. rend. Soc. Biol.*, 1901, 53, 551—553).—In a healthy young man who submitted to a sparse diet for some days, the body lost sodium chloride during the first three days, after which there was retention. The addition of more salt to the diet led to a retention of more proteid. Alcohol and iodides had no action either on the salt or nitrogen of the urine.
W. D. H.

Influence of Caffeine on Nitrogenous Excretion. By H. RIBAUT (*Compt. rend. Soc. Biol.*, 1901, 53, 393—395).—In small doses, caffeine diminishes, in large doses increases, nitrogenous excretion in dogs. This may explain previous contradictory statements on the subject.
W. D. H.

Influence of Nitrogenous Food on the Excretion of Uric Acid. By E. MAUREL (*Compt. rend. Soc. Biol.*, 1901, 53, 427—430).—If the food contains but little nitrogen, uric acid diminishes in the urine. It is regarded as a product of incomplete katabolism.
W. D. H.

Excretion of Kynurenic Acid. By LAFAYETTE B. MENDEL and EDWARD C. SCHNEIDER (*Amer. J. Physiol.*, 1901, 5, 427—456. Compare this vol., ii, 259).—Kynurenic acid is always found in the urine of fasting dogs, and when putrefaction in the intestine is checked by calomel. Iodoform stimulates proteid metabolism, and increases the output of kynurenic acid. Salol and naphthalene, and in one case sterilised meat, check the output without any marked decrease of nitrogenous excretion. Phosphorus, phloridzin, and less constantly sodium oxalate and hydrazine sulphate, stimulate proteid katabolism and increase the kynurenic acid excreted. The ingestion of gelatin, elastin, cartilage, ovomucoid, and thymus does not lead to formation of kynurenic acid; that of pancreas, lymph glands, fibrin amandin (a pure vegetable proteid) does so. Proteose feeding leads to a large increase of the acid, but products of proteolysis which do not give the biuret reaction do not. Glycocine does not interfere with its elaboration. Attempts to obtain evidence of the synthesis of the acid from tyrosine failed.
W. D. H.

Influence of Diet on the Phosphoric Acid and Sodium Chloride of the Urine. By E. MAUREL (*Compt. rend. Soc. Biol.*, 1901, 53, 430—431).—The quantity of phosphates in the urine is approximately the same as in the food. The same is true for sodium chloride; most of the salt ingested leaves the body in 24 hours; the excretion is complete in 2 days.
W. D. H.

Composition of Œdema-fluid. By J. BAYLAC (*Compt. rend. Soc. Biol.*, 1901, 53, 519—521).—A number of analyses of dropsical fluid is given. No diagnostic difference between the fluid in cases of kidney and heart disease was noted. W. D. H.

Albumins in Dropsical Pus. By F. MALMÉJAC (*J. Pharm.*, 1901, [vi], 14, 15—17).—Analyses are given of pus taken from a dropsical patient at different periods; the albumins differ considerably, the serum-albumin in the sample taken first being almost replaced by Patein's albumin in the sample taken a month later. R. H. P.

Analysis of Pus from a Tumour in the Kidney. By GUSTAVE PATEIN and POYOU (*J. Pharm.*, 1901, [vi], 14, 54—56).—Analyses are given of the pus from a tumour in the kidney and of urine passed by the patient. Although both contained dextrose, the composition of the pus was quite different from that of the urine. R. H. P.

Analysis of Calculi from the Pancreas. By LEGRAND (*J. Pharm.*, 1901, [vi], 14, 21—22).—An analysis of some calculi from the pancreas of a diabetic patient gave 1.7 per cent. of sodium chloride, 2.4 per cent. of disodium phosphate, 93.1 per cent. of calcium carbonate, and 0.7 per cent. of organic matter; tyrosine was not found. R. H. P.

Relation between Chemical Constitution and Physiological Action in the Piperidine Series. By RICHARD WOLFFENSTEIN and EDUARD WOLFFENSTEIN (*Ber.*, 1901, 34, 2408—2410).—The physiological action of the following three groups of piperidine derivatives has been investigated.

(1) Alkyl derivatives with alkyl linked to carbon; (2) Alkyl derivatives with alkyl linked to nitrogen; (3) Acyl derivatives. The experiments were carried out on rabbits and frogs. The two classes of alkyl derivatives are qualitatively similar in their action, but quantitatively different, whilst the acyl derivatives have a different type of action. The paper contains a list of the lethal doses of the various compounds investigated. K. J. P. O.

Action of Peroxides on Toxins. By NATALIE SIEBER (*Zeit. physiol. Chem.*, 1901, 32, 573—591).—The peroxides of calcium and hydrogen remove the poisonous characters of tetanus-toxin, diphtheria-toxin, and abrin. Animal and vegetable oxydases have the same action on the two first-named toxins, but not on abrin. This action of oxydases occurs, not only *in vitro*, but also by simultaneous injection *in vivo*. Potassium nitrate extracts no oxydase from the fibrin of normal horse's blood, but it does from the fibrin of the blood of horses rendered immune to diphtheria. Extracts which are not active to guaiacum tincture are also inactive towards toxins. W. D. H.

Chemistry of Vegetable Physiology and Agriculture.

Chemical Stimulants. The Function of Zinc and Copper in the Nutrition of *Aspergillus Niger*. By ANDREAS RICHTER (*Centr. Bakt. Par.*, [ii], 1901, 7, 417—429).—Zinc sulphate added to nutrient solutions in which *Aspergillus niger* is grown diminishes the dry yield until the dilution reaches about 350 litres per gram-molecule of zinc salt and then acts as a stimulant, the growth produced being about double that formed in the absence of zinc. Copper sulphate, on the other hand, also acts as a poison until about the same degree of dilution is attained, but then does not act as a stimulant but as a slightly depressing agent, even in dilutions of 150,000,000 litres per gram-molecule. The directly poisonous effect of both salts is probably to be attributed to the action of undissociated molecules, whilst the stimulating effect of the zinc salt, and the slightly depressing effect of the copper salt are due to the ions present in the dilute solutions.

A. H.

Fermentation of Glucose by *Bacterium Icteroides*. By ARTHUR HARDEN (*Trans. Path. Soc.*, 1901, 52, 115—117).—The characteristics of the action of the *Bacterium icteroides* on dextrose is indistinguishable from that of the *Bacillus coli communis* (*Trans.*, 1901, 79, 612).

W. D. H.

Indole-like Reaction given by Cultures of the Diphtheria and Pseudo diphtheria Bacilli. By RICHARD T. HEWLETT (*Trans. Path. Soc.*, 1901, 52, 113—114).—The pink reaction obtained by the addition of a strong acid and a weak nitrite solution to cultures of the diphtheria and pseudo-diphtheria bacilli is not due to indole, for the substance which gives the reaction is not volatile. Further investigation showed that the substance which gives the reaction is scatole-carboxylic acid.

W. D. H.

Influence of Chemical Reaction on the Bactericidal Action of Serum. By A. HEGELER (*Arch. Hygiene*, 1901, 40, 375—381).—The bactericidal power of active rabbit's serum is unaltered by small additions of sodium carbonate, but if the serum is inactive, the addition inhibits the increase of typhoid bacilli. Small additions of acid have no influence, but if sufficient acid is added to render the serum distinctly acid, the power of the serum to kill these bacilli is completely lost.

W. D. H.

Preparation of Bottom Fermentation Yeasts having the Property of Fermenting at High Temperatures and the Method of employing them. By GEORGES JACQUEMIN (*Bull. Soc. Chim.*, 1901, [iii], 25, 734—736).—The ordinary bottom fermentation yeasts were cultivated through a large number of generations in worts in which the acidity was gradually increased and the temperature progressively raised; the acid added was either tartaric, citric, or

lactic, and the final concentration of acid equivalent to 7 grams of tartaric acid per litre, the final temperature being 20—25°. The yeast finally obtained was able to cause vigorous fermentation at 20—25°, and retained this property after being grown for several generations in a neutral wort. Details are given for using this yeast for the preparation of a bottom fermentation beer, which need not, like the beers ordinarily obtained with bottom yeasts, be kept at a low temperature, either for storage or transit.

W. A. D.

Influence of Oxygen on the Fermentation produced by different Species of Yeast. By D. IWANOWSKI and S. OBRASTZOFF (*Centr. Bakt. Par.*, [ii], 1901, 7, 305—312).—Three species of yeast, *S. Pombe*, *S. ellipsoideus*, I., and *S. cerevisiae*, I., were cultivated in solutions containing peptone, inorganic salts, and about 5 per cent. of sucrose, parallel experiments being made (1) in a current of air and a current of nitrogen; (2) in an atmosphere of air and an atmosphere of nitrogen, the liquid being left at rest and not disturbed by a current of the gas. After about 48 hours, unfermented sugar being still present, the dry weight of the yeast and the residual sugar were estimated, the solutions having been inoculated with equal weights of the same culture of yeast. From the numbers thus obtained was calculated the fermentation energy (the weight of sugar decomposed by 1 gram of yeast). In no case was the presence or absence of oxygen found to produce any appreciable difference in the fermentative energy of the yeasts employed.

In the experiments of the second series, only a trace of yeast was sown into the solution, and in these cases it was also found that the ratio of yeast produced to sugar decomposed (Pasteur's ratio) was not affected by the presence or absence of oxygen. The experiments of Korff (*Centr. Bakt. Par.*, [ii], 1898, 4, 465), who found that the effect of oxygen varied on different races of the same species of yeast, are probably inaccurate.

A. H.

Invertase and Maltase in Yeast. By THOMAS BOKORNY (*Chem. Zeit.*, 1901, 25, 502—504. Compare this vol., i, 437).—Yeast maltase has its maximum action at 40°, and is destroyed after 30 minutes at 55°; 0.01 per cent. silver nitrate, 0.02 mercuric chloride, 0.5 sulphuric acid, 1.0 hydrochloric acid, 1.0 oxalic acid, 1.0 sodium hydroxide, 1.0 formaldehyde, and 1.0 per cent. phenol all destroy the enzyme after 24 hours' contact. Turpentine water, 1 per cent. thymol, and 5—10 per cent. alcohol destroy the activity of the enzyme to a large extent.

Invertase is destroyed when heated to 70°, and slowly when heated to 50°; also by 0.1 per cent. silver nitrate, 0.5 mercuric chloride, 5.0 oxalic acid, 1.0 per cent. sodium hydroxide, but not by 0.1 per cent. mercuric chloride, 0.5 sulphuric acid, 0.5 lactic acid, 1.0 oxalic acid, 1.0 hydrochloric acid, 1.0 acetic acid, 0.5 sodium hydroxide, 5.0 formaldehyde, 1.0 phenol, 0.1 per cent. thymol, turpentine water, chloroform water, or absolute alcohol.

J. J. S.

Selection of Carbohydrates by different Yeasts during Alcoholic Fermentation. By WILHELM KNECHT (*Centr. Bakt. Par.*, [ii], 1901, 7, 161—167, 215—228).—Yeast of two varieties (*Frohberg* type

and *Saaz* type of Nürnberg yeast) was cultivated in yeast water and in asparagine solution supplied with the necessary salts in presence of varying amounts of dextrose and lævulose, in order to ascertain what effect varying proportions of these two sugars exerted on the growth and fermentative power of the yeast, and whether the yeast exerted a selective action on the sugars.

The effect produced by variation in the total and relative amounts of the two sugars was found to vary with the kind of yeast and with the nature of the nitrogenous nourishment. Yeast water proved to be decidedly more favourable for the reproduction of the yeast than asparagine. When pure sucrose, which is converted into equal parts of dextrose and lævulose, is used, the dextrose is fermented more rapidly than the lævulose, as has been found previously by Prior. In presence of 8.19 per cent. of dextrose and 1.03 of lævulose, the amount of dextrose fermented in 8 days was 10 times that of the lævulose, and this relation only varied slightly in the different media and for the two varieties of yeast. On the other hand, and in presence of 8.22 per cent. of lævulose and 0.82 per cent. of dextrose, the amount of lævulose fermented in 4 days was, in some cases, as much as 24 times as great as that of the dextrose. When the results are expressed in terms of the amounts fermented by 1,000,000 cells, it may be said that in the most favourable case, in presence of excess of dextrose, 9 parts of dextrose are fermented for 1 of lævulose, whilst in presence of excess of lævulose, 13 parts of lævulose are fermented for 1 of dextrose. The author, however, concludes that the differences in the rapidity of the fermentation of the different sugars are entirely due to physical laws, as already stated by Prior.

A. H.

Nitrification and Denitrification. By ALFRED BEDDIES (*Chem. Zeit.*, 1901, 25, 523—524. Compare *Abstr.*, 1900, ii, 34).—Sterilised sand, containing calcium carbonate (0.2 per cent.) and ammonium sulphate (N=0.1 per cent.), was inoculated with nitrifying and with denitrifying organisms, and the loss of nitrogen determined. Addition of unsterilised sand caused a loss of half the nitrogen in 10 days, whilst straw extract caused a loss of 60 per cent. in about the same time. Inoculation with a pure cultivation of nitrifying organisms resulted in the almost complete conversion of the nitrogen into nitric nitrogen in 8 days. With straw extract, in conjunction with nitrifying organisms, there was a loss of 40 per cent. of the nitrogen, 20 and 40 per cent. being recovered in the form of nitrous and nitric acids respectively. Addition of a strong humus solution (from peat) along with straw extract reduced the loss due to straw extract to 30 per cent.; 30 and 40 per cent. of nitrogen remained as nitrous and nitric acids. When the sand, to which humus and straw extract were added, was also inoculated with nitrifying organisms, no loss of nitrogen took place, 90 per cent. being recovered in the form of nitric, and 10 per cent. as nitrous, acid.

N. H. J. M.

Humidity of Soils and Denitrification. By ERCOLE GIUSTINIANI (*Ann. Agron.*, 1901, 27, 262—285).—Denitrification is most energetic in liquids at a temperature which is injurious to the activity of nitrifying organisms.

As regards the effect of moisture, it was found that in sand the energy of nitrification of ammonium sulphate was directly proportional to the amount of moisture, when this varied from 0—16 per cent.; denitrification of sodium nitrate only took place when the percentage of moisture was less than 10, and was greatest in presence of 2 per cent. of moisture. As compared with nitrification, denitrification was very limited in these experiments. Similar results were obtained in soil.

In the case of soil containing little moisture, denitrification is proportional to the amount of organic matter. N. H. J. M.

Germination of Wheat Grain treated with Copper Sulphate. By E. DEMOUSSY (*Ann. Agron.*, 1901, 27, 257—261. Compare this vol., ii, 266 and 335; and Devaux, *Compt. rend.*, 1901, 132, 719).—Notwithstanding the great sensitiveness of plants to copper salts, the treatment of seeds with copper sulphate is, in practice, without injurious effects, owing to the diffusion into the soil of the traces of copper salt adhering to them. N. H. J. M.

Respiration of Quiescent Seeds. By R. KOLKOWITZ (*Chem. Centr.*, 1901, ii, 136; from *Ber. bot. Ges.*, 19, 285—287).—Experiments on the respiration of barley grains have been made by means of an apparatus allowing of the exact estimation of small quantities of carbon dioxide. From grains containing 11—15 per cent. of water, only 0.33 to 1.5 mg. of carbon dioxide were obtained per day and per kilogram, but by increasing the quantity of water, respiration was increased, thus grains containing 33 per cent. expired about 2 grams for the same time and weight. Rise of temperature and addition of oxygen also accelerate respiration. The respiration of the embryo is about three times that of the endosperm. Coarse maceration of the dry grains causes increase of respiration, but further division has the reverse effect. Respiration is stopped by heating the coarse meal at 100°, or by treating with 96 per cent. or with absolute alcohol. By moistening the grains with water in which toluene has been shaken, energetic respiration is induced, but thymol water, on the other hand, has no effect. Mercuric chloride destroys vitality, but does not entirely prevent a very slight evolution of carbon dioxide (compare Hahn, this vol., ii, 121). E. W. W.

Influence of Sodium Fluoride on the Action of Seminase on the Carbohydrates in the Horny Albumens of the Seeds of Leguminosæ. By HENRI HERISSEY (*Compt. rend.*, 1901, 133, 49—52).—Seminase (*Abstr.*, 1900, i, 320, ii, 35, 233) exists in the seeds of *Trigonella Foenum-græcum*, *Robinia Pseud-acacia*, *Ulex europæus*, *Cytisus Laburnum*, *Sarothamnus scoparius*, as well as in lucerne and indigo. Under ordinary conditions, the action of this ferment on the carbohydrates of the horny albumen of the seeds is slow, but in presence of sodium fluoride (1.5 in 100) it is much more rapid, and can be utilised for the preparation of mannose, which is readily isolated by means of phenylhydrazine. Potassium and ammonium fluorides, and potassium and sodium hydrogen fluorides, do not give such good results. C. H. B.

Carbohydrate Metabolism in Winter Leaves. By FRIEDRICH CZAPEK (*Chem. Centr.*, 1901, i, 1295; from *Bot. Zeit.*, 19, 120—128).—The minimum concentration of sugar solutions with which floating evergreen leaves, free from starch, can produce appreciable amounts of starch grains in the chloroplast, is raised by low temperatures. In experiments with various winter leaves, it was found that, whilst at 0° to 2° abundance of starch was produced with 10 per cent. sucrose, at 16° to 18° there was a production of starch with 2 per cent. solutions.

N. H. J. M.

Vegetation of *Nostoc Punctiforme* in presence of different Carbohydrates. By RAOUL BOULHAC (*Compt. rend.*, 1901, 133, 55—57. Compare Abstr., 1899, ii, 46 and 238; and Radais, *ibid.*, 1900, ii, 362).—In experiments with different carbohydrates, it was found that saccharose, maltose, and starch may be substituted for dextrose for cultivating *Nostoc*; very little growth was obtained in presence of lactose, and levulose is unsuitable. The available carbohydrates are those which readily yield dextrose when hydrolysed; this is probably effected by diastases, secreted either by nitrogen-fixing bacteria present on the surface of the plant or by the *Nostoc* itself.

Negative results were obtained with arabinose, xylose, galactose, sorbose, trehalose, melezitose, raffinose, mannitol, glycerol, dulcitol, perseitol, gum arabic, and dextrin.

N. H. J. M.

Fixation of Metals by Cell Walls. By H. DEVAUX (*Compt. rend.*, 1901, 133, 58—60).—Plant stems from which the potassium and calcium were completely extracted by acidified water were found to absorb appreciable amounts of potassium, lithium, sodium, calcium, strontium, barium, iron, nickel, cobalt, cadmium, copper, lead, and silver from their salts, which were not removed by washing with distilled water. The solubility of the salt and the nature of the acid seem to be without influence when stems saturated with potassium or lithium are placed in solutions of other salts (copper, iron, or cobalt sulphates, &c.). The original metal is displaced by the second. The process may be reversed; alkali metals in neutral solutions take the place of calcium, although the calcium resists the action of pure water. Heavy metals and metals of the alkaline earths seem, however, to be held with greater tenacity than alkali metals.

Iron is completely fixed, and is not affected by eight hours' contact with concentrated solutions of alkali salts or salts of the alkaline earths.

N. H. J. M.

New Chromogen producing a Carmine-red Dye. By HANS MOLISCH (*Chem. Centr.*, 1901, i, 1295; from *Bot. Zeit.*, 19, 149—152).—*Schenckia blumenaviana*, a rubiaceous plant of Brazil, produces a red dye in all parts when it dies naturally, or when killed by chloroform or alcohol vapour, or by 20 per cent. alcohol. The alcoholic solution shows a blue fluorescence, which is also produced by treating the leaves with 1 per cent. sulphuric acid or acetic acid, and by extracting them with hot water. The fluorescence disappears when

potassium hydroxide or ammonia is added. The leaves of the plant remain green in ammonia vapour.

The chromogen may be extracted from the fresh leaves by water free from air at 27°; the fluorescent solution gradually becomes carmine-red when exposed to air. Dead leaves yield a fluorescent solution, but no dye.

The chromogen is not rubian, and the dye is not alizarin or purpurin. N. H. J. M.

New Alkaloid from the Elder Tree. By F. MALMÉJAC (*J. Pharm.*, 1901, [vi], 14, 17—19).—The bark of the elder (*Sambucus nigra*) possesses a well-known diuretic and purgative action; this is probably due to the alkaloid *sambucine*, which has been extracted from the bark, and also from the fresh leaves, by Stas' method. An aqueous solution of the *hydrochloride* gives a yellow-white coloration with Tanret's reagent and a brown one with Bouchardat's. Sambucine is very deliquescent, gives the usual precipitates with alkaloidal reagents, and tastes bitter. In addition to the alkaloid, the author also obtained from the bark a *tannin*, a purgative *resin*, which smelt like scammony, and a yellowish-red *oil*, which had a strong elder-like odour.

R. H. P.

Milk from [Cows grazing on] the Plateau of Sétif (Algeria). By F. MALMÉJAC (*J. Pharm.*, 1901, [vi], 14, 70—74).—The milk from cows grazing off poor and dried-up grass on the Plateau of Sétif, in Algeria, is compared with that from cows fed on rich forage. The total solids vary in the former from 14.25 to 11.62 per cent., in the latter from 14.90 to 13.76; the fats from 3.50 to 3.33 and from 4.90 to 4.05; the sugar (principally lactose) from 4.46 to 3.13 and from 4.54 to 3.33; the ash from 0.90 to 0.60 and from 0.93 to 0.82; the proteid matter from 5.64 to 4.53 and from 5.55 to 4.47.

R. H. P.

Composition and Nutritive Value of the principal Vegetables. By BALLAND (*Rev. Intern. Falsific.*, 1901, 14, 76—78).—More than seventy analyses of various vegetables and parts of vegetables are given. Determinations were made of the dry matter, nitrogen, fat, extract, and cellulose, and, in most cases, of the sugar and acidity also.

The most nutritious vegetables are potatoes and artichokes; then, mushrooms, salsify, asparagus, cauliflower, cabbages, peas and haricots, spinach, sorrel, and lettuce. Other vegetables have very little nutritive value. N. H. J. M.

Food Requirements of Cultivated Plants. By EMIL GODLEWSKI (*Chem. Centr.*, 1901, i, 1247—1248; from *Zeit. landw. Versuchs-Wes. Oesterr.*, 4, 479—536).—Plot experiments with exhausted soil, in which wheat, rye, potatoes, and barley were partially manured. Although the soil contained about the same amounts of K_2O and P_2O_5 soluble in 25 per cent. hydrochloric acid, phosphatic manure had hardly any effect, whilst potassium manures were very effective. In absence of potassium manures, potatoes had a tendency to premature loss of leaf, and this was increased by applying nitrogen and

phosphoric acid. Nitrogenous and phosphatic manures may diminish the yield and injure the quality of potatoes when potash is deficient.

When potassium is deficient in soils, the relations of $K_2O:N$ and $K_2O:P_2O_5$ in potato tubers are reduced, and when nitrogen is deficient, the relation of nitrogen to nearly all the ash constituents is reduced. The relation of $K_2O:N$ depends partly on the variety and on climatic conditions.

The analysis of barley straw gives better indications than the grain as to the composition of the soil. When the dry matter contains less than 1 per cent. of potash, it is to be attributed to deficiency of potash in the soil. The normal relations of the different constituents are $K_2O:N:P_2O_5:CaO:MgO=100:50:30:40:10$. Deficiency of nitrogen only affects the relation of nitrogen to phosphoric acid.

N. H. J. M.

Variations in the Amounts of Nutritive Substances in Oats. By ALBERT ATTERBERG (*J. Landw.*, 1901, 49, 97—172. Compare Abstr., 1888, 317).—Results of analyses of oats may give some indications as to the relative amounts of nutritive substances in the soil, but any conclusions drawn from the results must always be more or less uncertain. It is, however, always possible to ascertain which constituent is taken up each year in the relatively smallest amount, and which in greatest amount.

The oats should be analysed before they are ripe, as in ripening a loss of potassium salts often takes place.

The following numbers show the amounts of the different constituents found in ripe oats:

	In grain.		In straw.		
	N.	P_2O_5 .	K_2O .	CaO.	MgO.
Lowest	1.20—1.36	0.37—0.50	0.28—0.73	0.14—0.21	0.08—0.13
Low	1.37—1.54	0.51—0.63	0.74—1.20	0.22—0.31	0.14—0.18
Mean	1.55—1.73	0.64—0.76	1.21—1.69	0.32—0.43	0.19—0.25
High	1.74—1.94	0.77—0.90	1.70—2.20	0.44—0.57	0.26—0.33
Highest ...	1.95—2.32	0.91—1.09	2.21—2.81	0.58—0.75	0.34—0.42

N. H. J. M.

Experiments with German, English, and French Mangels. By FERDINAND WOHLTMANN (*Bied. Centr.*, 1901, 30, 468—470; from *Zeit. landw. Ver. Rheinpreussen*, 1900, 17, No. 14. Compare Abstr., 1900, ii, 501).—The results of experiments with German (11), French (5), and English (4 varieties) mangels are given. The highest percentage of sugar (6.95), as well as the greatest yield of sugar per acre, was obtained with an English variety (mammoth long red).

The manurial effect of "martellin," which consists chiefly of potassium silicate, was compared with that of potassium chloride. Potassium chloride proved to be the better manure, but it is possible that the silicate may have a considerable after effect.

N. H. J. M.

Effect of various Carbonaceous Compounds on the amount of Nitrogen in Soil, and on the development of Plants. By MAX GERLACH (*Bied. Centr.*, 1901, 30, 446—449; from *Jahresber. landw. Versuchs-Stat. Posen*, 1899—1900, 10).—Unmanured soil recently taken from a field gave greater yields of white mustard and rye than the same soil kept for 4 or $4\frac{1}{2}$ months in boxes; the stored soil had been kept in a damp and loose condition.

Addition of straw, glycerol, dextrose, and lactates, both separately and in mixtures, considerably diminished the yields in the first year. In the second year, straw was beneficial, whilst glycerol and sodium lactate had hardly any effect. Fresh stable manure had very little effect in the first year, but gave a decided increase in the second.

Inoculation with alinit was injurious, and in presence of straw and glycerol much more injurious. The effect of alinit was, however, very slight in the second year.

The injurious effect of the carbonaceous substances employed is attributed to the destruction of the small amount of nitrate formed in the soil. Glycerol, lactates, and dextrose are used up during the first year.
N. H. J. M.

Value of Nitrogen in Horn-meal as compared with Nitric Nitrogen. By MAX GERLACH (*Bied. Centr.*, 1901, 30, 450).—Oats and carrots were grown in loamy sand, containing N 0.110 per cent., manured with sodium nitrate, ammonium sulphate, and horn-meal respectively, in increasing amounts. There were two series of pots, one with, the other without, lime. All the pots received sufficient potash and phosphoric acid.

The results, which are given in a table, are inconclusive; the experiments are being continued.
N. H. J. M.

Analytical Chemistry.

Tables for the Calculation of Quantitative Analyses. By A. SARTORI (*Zeit. anal. Chem.*, 1901, 40, 201—376, and 5 pages of Supplement).—This elaborate table gives factors, both numerical and logarithmic (7 places of decimals), for the conversion of substance found into substance sought in upwards of 1100 cases. It is based on the atomic weights published in 1898 by the German Committee (*Ber.*, 31, 2761), in which oxygen = 16.
M. J. S.

Value of the Correction for the Mercury Meniscus. By LUDWIG W. WINKLER (*Zeit. anal. Chem.*, 1901, 40, 403—404).—Glass tubes, with one end closed and the other ground flat, were fixed with the open ends upwards and filled with mercury. A plate of glass was then depressed upon the open ends of the tubes, and after its

removal the elevation of the meniscus above the edges of the tubes was measured with the cathetometer. For wide tubes (up to 25 mm. diameter), considerably higher values were obtained than those given by Bunsen. M. J. S.

New Form of Burette. By EDMUND THIELE (*Zeit. anal. Chem.*, 1901, 40, 405—406).—This burette is closed at its lower end, but has a hole in the side near that end. A glass cap, ending in a jet, and with an internal groove carried upwards from the jet as far as the hole, is ground to fit the end of the burette. By rotating either the cap or the burette itself, the groove is made to communicate with the hole. A side tube in the cap, opposite to the groove, communicates with the reservoir of standard solution, and allows the burette to be filled by rotating it through 180°. M. J. S.

Properties and Estimation of Alkali Persulphates. By B. MOREAU (*Chem. Centr.*, 1901, ii, 56—57; from *Apoth. Zeit.*, 1901, 16, 383).—A summary of the well-known properties of alkali persulphates. Two methods are recommended for the estimation of persulphates. (1) Five grams of potassium iodide are dissolved in 40 c.c. of water and 2 c.c. of sulphuric acid, water is added to make up to 50 c.c., 0.25 gram of the persulphate is added, and after 1 or 2 hours, the liberated iodine is estimated with *N*/10 sodium thiosulphate. Each c.c. of this represents 0.0135 gram of potassium, 0.0119 gram of sodium, or 0.0144 gram of ammonium persulphate.

(2) Two grams of potassium iodide and 2 grams of sodium hydrogen carbonate are dissolved in 50 c.c. of *N*/10 sodium arsenite, 0.25 gram of the persulphate is added, the whole heated just to boiling, and after 5 minutes, the liquid is again made up to 50 c.c. and titrated with *N*/10 iodine. The same calculation is applied. L. DE K.

Estimation of Ammonia in Urine. By OTTO FOLIN (*Zeit. physiol. Chem.*, 1901, 32, 515—517).—The urine is mixed with 400—500 c.c. of water, and then distilled for 45 minutes with magnesia or lime, and the ammonia collected in the usual manner in *N*/10 hydrochloric acid; the ammonia which passes over is the ammonia originally present in the urine, *plus* a certain amount due to the slow decomposition of urea. The amount of ammonia derived from the second source can be determined by making the residue in the flask up to its original volume, and distilling again for the same length of time. J. J. S.

Estimation of Phosphoric Acid as Ammonium Phosphomolybdate. By HENRI PELLET (*Anal. Chim. anal. appl.*, 1901, 6, 248—251).—A reply to Ledoux (*ibid.*, 224). The author refers to various publications by himself on the subject of the estimation of phosphoric acid as ammonium phosphomolybdate, results of which are now fully confirmed by Ledoux and several other chemists. The complete separation of the yellow compound in the cold requires a special shaking apparatus; on the whole, it is safer to heat the liquid in the water-bath. L. DE K.

Estimation of Phosphoric Acid in Phosphatic Manures, by Precipitation in the cold as Ammonium Phosphomolybdate. By L. LEDOUX (*Chem. Centr.*, 1901, i, 1341—1342; from *Bull. Assoc. Belge des Chimistes*, 1901, 15, 125—129).—The reagent is prepared by dissolving 150 grams of molybdic acid in 600 c.c. of ammonia of sp. gr. 0.96, and pouring this into 1070 c.c. of nitric acid of sp. gr. 1.22. To estimate the citrate-solubility, 2 grams of a superphosphate or 4 grams of a mixed phosphate are treated as usual with citrate solution, and the liquid is diluted to 250 c.c.; 50 c.c. are then boiled for 5 minutes with 15 c.c. of nitric acid of sp. gr. 1.40 to convert the phosphoric acid completely into the ortho-compound. When cold, 15 c.c. of ammonia of sp. gr. 0.92 are added, and then 100 c.c. of the molybdate solution, when the whole is stirred for 30 minutes by mechanical means at the rate of 250 times per minute. The precipitate may then be titrated according to Pemberton's directions, or dissolved in ammonia and precipitated with magnesia mixture. L. DE K.

Value of the Molybdate Process when estimating the Citrate-solubility of Basic Slag. By OTTO FOERSTER (*Chem. Zeit.*, 1901, 25, 421).—In order to obtain the "yellow precipitate" free from silica, the beaker containing the citrate solution of the phosphate and the molybdate reagent should be placed in the water-bath, heated to 80°, and kept there until cold. At a higher temperature, the precipitate will contain silicic acid. L. DE K.

Estimation of Phosphoric Acid in Soils by centrifugalising the Ammonium Phosphomolybdate. By EUGEN GULLY (*Chem. Zeit.*, 1901, 25, 419—421).—Von Jüptner's method for the rapid estimation of phosphorus in iron may be applied to soils. The hydrochloric acid solution of the soil is repeatedly evaporated with nitric acid to expel hydrochloric acid, and to render any silica insoluble. The residue is then dissolved in nitric acid of sp. gr. 1.19, and diluted to 50 c.c.; 25 c.c. of this solution are then introduced into a special calibrated apparatus, the graduated tube of which contains a 25 per cent. solution of ammonium nitrate, and heated for 10 minutes to 65°, when 25 c.c. of molybdate solution are added. After shaking for 1 minute, the apparatus is filled with the solution of ammonium nitrate, and then placed again for 20 minutes in the hot water, when it is taken out and whirled for 4 minutes in a centrifugal apparatus at 1100—1200 revolutions per minute. The volume of the precipitate is then read, and by means of a table the number of milligrams of phosphoric oxide corresponding with it is ascertained. When dealing with soils containing up to 0.184 per cent. of phosphoric oxide, 10 grams may be weighed; when richer samples have to be tested, a smaller quantity should be taken. L. DE K.

Gutzeit's Test for Arsenic. By F. C. J. BIRD (*Analyst*, 1901, 26, 181—187).—The author's apparatus consists essentially of a 150 c.c. flask, connected sideways with a long stemmed, bent top funnel holding 35 c.c. of hydrochloric acid. Seventy c.c. of the liquid to be tested for traces of arsenic, beer for instance, are introduced into the flask, 4 grams of pure zinc are added, and the whole is gently boiled

whilst the acid is gradually run in. The aqueous vapour is condensed in a bulb surrounded by cold water, and runs back into the flask. The hydrogen then enters a bulb into which an inverted funnel has been placed, and is washed by means of a 10 per cent. solution of lead acetate. After passing through a disc of lead acetate paper, the gas is made to act on two 5 mm. discs of mercuric chloride paper; a tube holding a disc of 20 mm. in diameter is also provided in case the amount of arsenic should be somewhat larger than expected. The discs will be coloured yellow or orange to orange-brown if the hydrogen contains arsenic hydride. The spots may be further identified by treating them with warm hydrochloric acid in which they are insoluble. After removal of the mercuric chloride, they may be dissolved in hydrochloric acid with the aid of a trace of bromine, and Bettendorff's stannous chloride test for arsenic may then be applied.

With care, it is quite possible to state positively whether the arsenic in the beer is below or exceeds a certain limit.

L. DE K.

Arsenic Estimations relating to Malt Kilns. By THOMAS FAIRLEY (*Analyst*, 1901, 26, 177—180).—Owing to the use of fuel contaminated with arsenic, this substance gradually accumulates, particularly in the unglazed tiles of the malt kilns and in the dust from the walls, &c.

For the qualitative detection of arsenic in the tiles, 2—5 grams of the finely-powdered material are heated with 20—50 c.c. of a pure 25 per cent. sulphuric acid on the water-bath for 2 hours, the whole is then diluted to 50—100 c.c., and a measured portion tested in the Marsh apparatus; by comparison with a standard set of mirrors from known amounts of arsenic, an approximate estimation may be made. For the gravimetric estimations, 10—20 grams of the sample are distilled with hydrochloric acid and ferrous chloride. The arsenic is then precipitated in the distillate by hydrogen sulphide.

Dust is treated in a similar manner after heating 1—5 grams with 10—50 c.c. of sulphuric acid and 20 c.c. of nitric acid until the nitric acid is driven off; the cold liquid is diluted to 50—100 c.c., and a portion tested in Marsh's apparatus. For the quantitative estimation, 5 grams of dust are distilled with hydrochloric acid and ferrous chloride.

As much as 1 per cent. of arsenious acid has been found in the dust, and 0.12 per cent. in unglazed floor tiles.

L. DE K.

Detection of Potassium by Sodium Picrate. By C. REICHARD (*Zeit. anal. Chem.*, 1901, 40, 377—384).—Potassium picrate being less soluble in water than the platinichloride, the use of a saturated (10 per cent.) solution of sodium picrate is advocated as a reagent for potassium. A 1 per cent. solution of potassium chloride mixed with an excess of the reagent gives a precipitate of acicular crystals; weaker solutions yield no precipitate. Other potassium salts (except the carbonate and cyanide) must be of at least 2 per cent. strength to afford precipitates. The reaction is not interfered with by the presence of sodium salts (except the carbonate), but ammonium salts and free acids must be absent. The reaction is still more sensitive for cæsium,

rubidium, and thallium salts than for those of potassium; lithium salts, on the contrary, are not precipitated.

M. J. S.

Estimation of Potassium. By O. SCHUMM (*Zeit. anal. Chem.*, 1901, 40, 385—389).—The platinichloride, instead of being weighed, may be dissolved and electrolysed. From a solution acidified with 1/50 of its volume of sulphuric acid (1:5) and kept at 55—65°, the platinum is completely deposited in a state resembling hammered platinum by a current of $ND.100 = 0.03$ ampere and 1.2 volts in 5—6 hours. The metal should be deposited on the inside of a platinum capsule. Employing Fresenius' method of precipitation, but washing with absolute instead of 80 per cent. alcohol, the factor 0.764595 was obtained for 2KCl/Pt with quantities of about 0.2 gram of potassium chloride; for quantities of 0.033 gram, the factor was 0.76689.

M. J. S.

Estimation of Silver in Ores containing Sulphur. By AUGUSTE HOLLARD (*Ann. Chim. anal. appl.*, 1901, 6, 251—253).—One hundred grams of the finely powdered mineral (galena, for instance) are heated with 600 c.c. of water and 140 c.c. of nitric acid, and when practically dissolved, a few drops of a solution of lead chloride saturated at 80° are added, and the whole kept at that temperature for some time. The insoluble matter is collected on a filter and washed, and should it be suspected to contain much lead sulphate, this may be removed by means of aqueous sodium hydroxide of sp. gr. 1.1. The residue is now treated with 250 c.c. of a 2 per cent. solution of potassium cyanide which dissolves any silver chloride, and from the solution the metal is then deposited by electrolysis for a few hours, using a current of 0.05 ampere. The deposit may be weighed, but if it is very trifling (and the process is really intended for extremely poor ores) it is best estimated by dissolving it in nitric acid and titrating the solution with potassium thiocyanate, with iron alum as indicator.

The process may be also applied to crude copper. This is dissolved in a mixture of nitro-hydrochloric and sulphuric acids and evaporated nearly to dryness; the mass is then dissolved in dilute nitric acid containing a little hydrochloric acid, and the insoluble residue treated with potassium cyanide as previously directed.

L. DE K.

Estimation of Calcium in high-grade Ferro-Silicon. By G. WATSON GRAY (*J. Soc. Chem. Ind.*, 1901, 20, 538—539).—A sample of ferro-silicon recently examined by the author contained as much as 3.29 per cent. of calcium in addition to small quantities of chromium, manganese, aluminium, magnesium, carbon, sulphur, phosphorus, tungsten, and traces of copper and nickel. So far as the author is aware, calcium has never been met with, as yet, in samples of ferro-silicon, although its presence may be explained by the fact that the flux used in its preparation is strongly calcareous.

Full details are given as to the best methods of testing for the various impurities. The alloy may be readily decomposed by hydrochloric acid after a preliminary fusion with sodium potassium carbonate. After separating the silica, calcium, &c., is estimated in the acid filtrate as usual.

L. DE K.

Cement Testing. By OTTO H. KLEIN and STEPHEN F. PECKHAM (*J. Soc. Chem. Ind.*, 1901, 20, 539—544. Compare Abstr., 1900, ii, 627).—A criticism of the methods proposed for the chemical testing of hydraulic cement. Humphrey's method, which involves a preliminary fusion of the sample with sodium carbonate, is not suitable, as it also gives the silica from any undecomposed clay, which is, of course, worthless.

The sample for chemical analysis should be exactly like the one submitted to the physical tests, and should neither be dried nor powdered. Five grams should be treated in the cold with 250 c.c. of hydrochloric acid containing 10 per cent. of hydrogen chloride, and stirred at intervals for half an hour. Any residue should be collected and weighed, and further examined if necessary. The solution is now evaporated to render the silica insoluble, and the mass treated in the usual manner with hydrochloric acid. The silica thus obtained represents the soluble, or available, silica in the sample. Aluminium, iron, calcium and magnesium oxides, alkalis and sulphates, are estimated in the filtrate by the ordinary methods. Matter volatile at a red heat is estimated in another portion of the sample. L. DE K.

Estimation of Zinc by means of Iodine Solution. By PETER KNAPS (*Chem. Zeit.*, 1901, 25, 539—540).—Zinc may be accurately estimated by precipitation in acetic acid solution by means of hydrogen sulphide, removing the excess of this by boiling, and titrating the precipitate with excess of standard iodine and sodium thiosulphate. If, however, the solution contains more than 0.05 gram of zinc per 200 c.c., the zinc sulphide, owing to the separated sulphur, partly escapes the action of the iodine.

This inconvenience may be avoided by adding to the solution, previous to the precipitation of the zinc, 10—20 c.c. of a solution of 150 grams of crystallised barium chloride per litre, and the same quantity of a solution of 200 grams of crystallised sodium sulphate per litre; the precipitated barium sulphate then prevents the zinc sulphide from conglomerating. L. DE K.

Detection of Mercury in Urine. By BRUNO BARDACH (*Chem. Centr.*, 1901, ii, 1344; from *Centr. Bl. inn. Med.*, 22, 361—364).—Two hundred and fifty to 1000 c.c. of the urine are mixed with 0.8 gram of finely divided egg-albumin, 5—7 c.c. of 30 per cent. acetic acid are added, and the albumin precipitated by heating in the water-bath. The coagulum, which contains all the mercury, is collected and dissolved in 10 c.c. of hydrochloric acid of sp. gr. 1.19. This solution is then heated for 45 minutes with a clean copper spiral in the boiling water-bath. The spiral is washed with water, alcohol, and ether, carefully dried between filter-paper, and then heated in a long glass tube with a particle of iodine. If mercury is present, a yellowish or red ring will form on the colder part of the tube. L. DE K.

Estimation of Manganese in Ferro-Manganese and Nickel in Steel. By GEORGE L. NORRIS (*J. Soc. Chem. Ind.*, 1901, 20, 551).—*Estimation of Manganese in Ferro-Manganese.*—0.5 gram of the sample is dissolved in 15 c.c. of nitric acid of sp. gr. 1.42, and the

solution evaporated to dryness. The residue is dissolved in 30 c.c. of dilute hydrochloric acid (1:1), and introduced into a separating funnel. After adding a few drops of bromine and 40—50 c.c. of acetone, the liquid is shaken with 75 c.c. of ether, which dissolves the ferric chloride. The aqueous layer is removed and mixed with 300 c.c. of hot water to expel the bulk of the ether and acetone, the whole is brought to the boiling point, 5 grams of sodium acetate are added, and the manganese is precipitated as phosphate by adding 20 c.c. of a 10 per cent. solution of sodium ammonium phosphate and an excess of ammonia. After weighing the ignited precipitate, it may be tested in the usual way for traces of silica and iron, which, however, are as a rule practically absent; if chromium is present, this may be estimated by dissolving the precipitate in just sufficient hydrochloric acid, and reprecipitating the chromium as phosphate by addition of sodium acetate.

Estimation of Nickel in Steel.—One gram of steel is dissolved in 20 c.c. of nitric acid of sp. gr. 1.2, and the liquid evaporated to dryness, and then dissolved in 30 c.c. of dilute hydrochloric acid (1:1). After transferring it to a separating funnel, a few drops of bromine and 50 c.c. of acetone are added, and the whole is then shaken with 50 c.c. of ether; the aqueous layer is drawn off and shaken once more with 50 c.c. of ether. After adding 300 c.c. of hot water, and then boiling for a moment, 10 grams of sodium acetate and 10 c.c. of a 10 per cent. solution of sodium ammonium phosphate are added, the boiling is continued, and excess of ammonia is added. Any iron, manganese, chromium, or aluminium is precipitated as phosphate, whilst nickel and any copper remain in solution. The copper is removed by adding hydrochloric acid and passing hydrogen sulphide, and the nickel then precipitated in the filtrate by neutralising with ammonia and boiling. The nickel sulphide is finally converted into oxide by ignition, and weighed as such.

L. DE K.

Potassium Thiocyanate as Indicator in the reduction of Ferric Salts. By JAKOB VOLHARD (*Zeit. angew. Chem.*, 1901, 14, 609—610).—The author rejects as perfectly untrustworthy the process recommended by Ebeling (this vol., ii, 424). Potassium thiocyanate is gradually reduced by nascent hydrogen, and then no longer indicates the presence of ferric iron; the result obtained by titration with permanganate may, therefore, be too low; on the other hand, if after complete reduction of the iron, any thiocyanate is left, this will consume some permanganate and the result will be too high.

L. DE K.

Detection of Tin. By OTTO SCHMATOLLA (*Chem. Zeit.*, 1901, 25, 468).—If a porcelain or glass rod, or, better still, a narrow test-tube containing water, is dipped into a solution of tin in hydrochloric acid, and then held in a colourless bunsen flame, an intensely white flame is noticed, which persists until the hydrogen chloride is driven off. Antimony does not interfere with the reaction, but an excess of arsenic prevents it; a dark deposit of tin arsenide then forms on the glass. Curiously enough, the test does not succeed with platinum wire. As it is a very delicate one, it will no doubt be found useful in the analysis of tinned foods,

L. DE K.

Reaction characteristic of Pure Waters. By HENRI CAUSSE (*Compt. rend.*, 1901, 133, 71—74).—If a solution of 0.25 gram of crystal violet (hexamethyltriaminotriphenylcarbinol) in 25 c.c. of a cold saturated solution of sulphur dioxide is added in small quantity (1.5 c.c. to 100 c.c.) to pure water, the violet colour is restored, the intensity of the coloration being much greater if the water has been heated at 35—40° for two hours, and afterwards cooled before adding the reagent. All pure natural waters give this reaction, but if the water is contaminated with sewage or sewage effluent there is no production of colour, probably owing to the presence of sulphur compounds.

Where the new reagent gives a positive reaction, sodium *p*-diazobenzenesulphonate and magenta and sulphurous acid respectively give negative reactions, and *vice versa*. By means of the reagent, it was found possible to trace the appearance of sewage in the Rhone as the result of rain storms, and its gradual disappearance after the storms had ceased. C. H. B.

Technical Analysis and Softening of Feed-water for Boilers. By GIOVANNI GIORGIS and G. FELICIANI (*Gazzetta*, 1901, 31, i, 416—425).—A reply to criticisms on the authors' methods (*Abstr.*, 1899, ii, 453) made by Gianoli in a communication to the Chemical Society of Milan (see *L'Industria*, 1899, 13, 346—348). T. H. P.

The *iso*Purpuric Acid Reaction for Cyanides. By C. REICHARD (*Chem. Zeit.*, 1901, 25, 537—538, 555—556).—The author states that the well-known picric acid test for cyanides must be restricted to solutions of alkali cyanides. The solution should be moderately alkaline, and instead of picric acid its sodium salt should be used. Although warming accelerates the reaction, it is best to use cold solutions.

Insoluble cyanides when heated with solution of sodium picrate do not give the reaction. In a few instances, the test has more or less succeeded after heating the cyanide with solution of sodium hydroxide or with water and barium dioxide, but the reaction then becomes rather complicated. L. DE K.

Detection of Methyl Alcohol in the Presence of Ethyl Alcohol. By ALBERT B. PRESCOTT (*Pharm. Arch.*, 1901, 4, 86—90).—One c.c. of the sample, or enough to represent 1 c.c. of absolute alcohol, is put into a test-tube 16 mm. wide and 16 cm. long, and 8 c.c. of water are added. A copper coil, made from wire 1 mm. thick, and wound over a rod 7—8 mm. thick (and over the other end of the wire) to make a close coil 3—3.5 cm. long, with a stem of two twisted wires about 20 c.c. long and bent at right angles about 6 cm. from the free end, is heated in the upper part of a bunsen flame to a red heat, and plunged steadily to the bottom of the liquid for a second; this operation is repeated 4 or 6 times until the coil no longer turns bright. Six c.c. of a 3 per cent. solution of hydrogen peroxide are added to remove the acetaldehyde, and the liquid is filtered into a porcelain dish. After 3 minutes, 2 c.c. of a solution of sodium thiosulphate (1 : 10) are added to remove the excess of hydrogen peroxide

and the liquid is then tested for formaldehyde by means of phloroglucinol. One gram of this is dissolved in 90 c.c. of water, 20 grams of sodium hydroxide are added, and the whole diluted to 100 c.c.; 3 c.c. of this solution are added to the contents of the dish. If formaldehyde is present, a bright red colour (not a purple) will at once make its appearance, but unless it is very intense it will again rapidly fade. The presence of formaldehyde proves, of course, the presence of methyl alcohol in the spirit.

L. DE K.

New Method for identifying Renatured Spirits. By P. N. RAIKOW and P. SCHTARBANOFF (*Chem. Zeit.*, 1901, 25, 434—436).—As it is possible to remove the pyridine bases but not the methyl alcohol from denatured spirit, the authors identify renatured spirit by the presence of methyl alcohol, and this is easily recognised by converting it into formaldehyde. The spirit is first rendered absolute by means of anhydrous potassium carbonate, and 10—20 c.c. are then put into a 100 c.c. Erlenmeyer flask and at first gently warmed. Inside the flask, and close to the liquid, is then suspended a red hot platinum spiral of 0.3 mm. in thickness; thinner wire should not be used as the oxidation then proceeds in too violent a manner, and even pure ethyl alcohol would yield formaldehyde.

In the presence of methyl alcohol, formaldehyde is gradually formed and easily recognised by its odour. To detect the formaldehyde with certainty, the air escaping from the flask should be drawn by means of an aspirator through water contained in a test-tube; formaldehyde is dissolved in the water, whilst most of the acetaldehyde is carried away by the current of air. The presence of formaldehyde in the water may then be recognised both by the odour and other reactions.

L. DE K.

Estimation of Foreign Volatile Components of Explosives containing Nitroglycerol. By LOUIS W. DUPRÉ (*Chem. Zeit.*, 1901, 25, 540).—About 2 grams of the sample are dried for one hour in a watch glass placed on a copper water-bath not provided with holes. To prevent volatilisation of nitroglycerol, a tall, narrow beaker, which is weighed together with the watch glass, is placed over the latter; any fumes of nitroglycerol are condensed on the inner surface of the glass, but water-vapour is carried off by the air currents. The process is stated to have been found satisfactory in practice.

L. DE K.

Estimation of Minute Amounts of Sugar in Urine. By EMIL RAIMANN (*Zeit. anal. Chem.*, 1901, 40, 390—402).—An attempt to employ the process of Laves (*Abstr.*, 1893, ii, 555) for the estimation of sugar in normal urine showed that although concordant results were obtained, it was impossible to regard them as even approximately true. A large proportion of the precipitate is derived from substances other than sugar present in the urine, and an amount, varying according to circumstances, from the phenylhydrazine itself. The only method which gave satisfactory results was to take two portions of the sample of urine, free one of them completely from sugar by fermentation for 24 hours at 34° with yeast, precipitate both with phenylhydrazine, and estimate the sugar from the difference. Ex-

periments in which dextrose was added to a fermented urine, and the solution so obtained was analysed by this differential method, showed that the yield of osazone is only 49 per cent. of the calculated amount, and that the results did not vary more than 6 per cent. from the mean, even when the amount of sugar was as small as 0.04 gram per litre.

M. J. S.

Estimation of Sugar in Swedes. By SYDNEY HOARE COLLINS (*J. Soc. Chem. Ind.*, 1901, 20, 536—538).—The process is based on the estimation, by a colorimetric method, of the copper left in solution after heating the Fehling solution with sugar.

Ten grams of swedes, 100 c.c. of water, and 1 c.c. of a saturated solution of lead acetate are ground up together in a mortar and left for some hours. Fifty c.c. of the filtrate are put into a test-tube, 0.5 c.c. of sulphuric acid is added, and the liquid heated in a steamer for 20 minutes. When cold, 4 c.c. of the supernatant liquid are pipetted off, and mixed in a test-tube with 10 c.c. of freshly prepared Fehling solution of half the usual strength. The author has found that, in the circumstances, 10 c.c. of this Fehling solution represent 0.0216 gram of invert sugar, and this figure is used in the analysis of swedes. After replacing the tube in the steamer for 30 minutes, the cuprous oxide will have completely settled, and the colour of the liquid is now compared with a series of standard tints. These standards contain 0.125, 0.25, 0.375, 3.50, 0.625, 0.750, 0.875, and 1 c.c. respectively of Fehling's copper sulphate solution; to each is then added 2.5 c.c. of Fehling's alkaline tartrate solution, and the liquid is diluted to 14 c.c. Having thus ascertained how much copper solution has escaped reduction, the calculation of the percentage of sugar in the sample is an easy matter. When dealing with dried swedes, a yellow colour is imparted to the solutions, causing various shades of greenish-blue which cannot be well compared with the standards. In this case, the author uses a special colorimeter. On one pane of glass, a row of test-tubes containing alternately plain water and a graduated series of yellow solutions is placed; on another pane, a row of tubes containing the standard blue solutions is placed over the yellow tubes, blank spaces being left over the plain tubes to take the tubes used for the actual analysis. The pane holding the blue tints slides over the pane holding the yellow tints, producing any desired combination, and the whole is placed in a wooden frame at an angle of 45° with a white base board. Methyl-orange is a suitable material for making the yellow solutions.

Attention is called to the unequal distribution of the saccharine matter in a swede.

L. DE K.

Testing Flour. By ALEXANDER ZEGA (*Chem. Zeit.*, 1901, 25, 540—541. Compare *Abstr.*, 1900, ii, 503).—The reagent is prepared by diluting 3 c.c. of a concentrated solution of magenta in alcohol with water to 200 c.c. and passing sulphur dioxide until the liquid is completely decolorised; before use, this is diluted with water in the proportion of 1 to 10, and 1 c.c. of this solution should require for neutralisation 0.8 c.c. of *N*/10 alkali. To apply the test to flour, 1 gram of the sample (this may be measured) is put into a test-tube

and shaken with 10 c.c. of water and 1 c.c. of the reagent. When dealing with samples rich in bran, 1.5 or 2 c.c. should be added. Pure fresh flour remains colourless for 2 or 3 minutes, but when it is mouldy, or when it contains an undue excess of bran, it assumes a more or less intense red colour.

L. DE K.

Evaluation of Gum Arabic. By KARL DIETERICH (*Zeit. anal. Chem.*, 1901, 40, 408—410).—In connection with the researches of Fromm (this vol., ii, 426), the author states that he published in 1896 and 1897, in Helfenberger's *Annalen*, the results of acidity estimations in samples of gum arabic, and showed that direct titration by alkali always gave low results. The method he employed was to place 1 gram of the finely powdered gum in a mixture of 10 c.c. of $N/2$ aqueous, and 10 c.c. of $N/2$ alcoholic potassium hydroxide, and after 24 hours to titrate back with $N/2$ sulphuric acid. If either of the alkali solutions was used exclusively, the results were lower. Gum arabic consists chiefly of acid calcium salts, and it would seem that the conversion of these into normal salts is gradual.

M. J. S.

Analysis of Commercial Cream of Tartar. By HENRI QUANTIN (*Ann. Chim. anal. appl.*, 1901, 6, 244—248).—The total acidity of the sample is determined as usual; from this is deducted the acidity due to foreign acids, and the difference is calculated to potassium hydrogen tartrate. The acidity due to acids other than tartaric is estimated by recrystallising a known weight of the sample from boiling water and allowing to cool; an aliquot part of the filtrate is then titrated, allowance being made for the amount of potassium hydrogen tartrate which at a definite temperature is retained by the mother liquor.

The test may also be made as follows. One to two grams of the sample are treated with 25 c.c. of boiling water, and when cold a sufficiency of alcohol is added. The insoluble matter is then collected on a filter, washed with alcohol to remove the foreign acids, and the filter having been returned to the beaker, the mass is boiled with water and titrated.

When dealing with crude tartars the approaching end of the titration is generally shown by a change of colour of the solution; towards the finish, delicate litmus paper should be used.

L. DE K.

Analysis and Composition of Lemon Juices. By EDUARD SPAETH (*Zeit. Nahr.-Genussm.*, 1901, 4, 529—541).—Adulteration of lemon juice with water and citric acid may be detected by the diminished amount of ash, and by its alkalinity; 100 c.c. of normal juice yield from 0.374 to 0.455 gram of ash, and this requires for neutralisation 4 to 6 c.c. of N acid.

Adulteration with tartaric acid is best detected as follows: 10 c.c. of the sample are diluted to 50 c.c., and mixed with 50 c.c. of alcohol and 5—10 c.c. of basic lead acetate. The precipitate, which contains the organic acids as lead salts, is washed with dilute alcohol, then suspended in water, and decomposed with hydrogen sulphide; the lead sulphide is washed with hot water, and the filtrate concentrated to 10 c.c. This is neutralised with N alkali, and then mixed with 2.5 c.c.

of glacial acetic acid, 2 c.c. of a 20 per cent. solution of potassium acetate, and 40 c.c. of a 20—25 per cent. solution of potassium chloride. The whole is well stirred and 50 c.c. of 96 per cent. alcohol are added. After 12—18 hours, the separated potassium hydrogen tartrate is collected on a filter, washed first with dilute and then with absolute alcohol, dissolved in boiling water, and titrated with *N* alkali.

Other analytical processes are discussed, and several tables are given. As regards lemon-syrup, 100 c.c. of this should contain about 0.14 gram of ash, requiring 1.7 c.c. of *N* acid for neutralisation:

L. DE K.

Estimation of Uric Acid in Urine. By OTTO FOLIN and PHIL A. SHAFFER (*Zeit. physiol. Chem.*, 1901, 32, 552—572. Compare Abstr., 1898, ii, 196, 465; Wörner, 1900, ii, 251; Jolles, 1900, ii, 450).—In Salkowski's method for estimating uric acid it is advisable to precipitate the silver magnesium urate and phosphate together as recommended by Ludwig, as otherwise a small amount of urate (2 mg. per 100 c.c.) is lost during the precipitation of phosphates. The silver magnesium urate is then decomposed by hydrogen sulphide in acid solution and in order to precipitate readily all the silver it is advisable to add 5—10 c.c. of a 1 per cent. copper sulphate solution and boil. It is always necessary to make a correction for the solubility of uric acid, but the actual amount appears to vary in different cases.

The ammonium sulphate method has been somewhat altered as follows. A solution containing ammonium sulphate, 500 grams, uranium acetate, 5 grams, and 10 per cent. acetic acid, 60 c.c. per litre is prepared and 75 c.c. of this solution are mixed with 300 c.c. of the urine, kept for 5 minutes, passed through a double filter, and two quantities of 125 c.c. each collected. Five c.c. of concentrated ammonia are added to each and they are allowed to remain overnight, then filtered and the ammonium urate estimated as in the original method. The addition of uranium acetate is made in order to precipitate a minute quantity of mucoid substance which is otherwise thrown down on the addition of ammonia. As this also reduces permanganate, it accounts for the fact that the numbers previously found by the author and also by Jolles are too high. A correction of 3 mg. uric acid per 100 c.c. should always be made on account of the solubility of ammonium urate. The methods of Mörner and of Jolles are adversely criticised.

J. J. S.

Sensibility of the Methods for the Detection of Salicylic Acid in Wines. By ANTONIO J. FERREIRA DA SILVA (*Rev. Intern. Falsific.*, 1901, 14, 68—70).—A table showing the comparative delicacy of the chief methods in use for the detection of salicylic acid in wines.

The method in use in the municipal laboratory in Paris, extraction with ether and purification of the extract with benzene, shows 1 part of the acid in 33,000 parts. Weigert-Rösler's method, extraction with chloroform or carbon disulphide, shows 1 part in 100,000. The original official German method, extraction with a mixture of ether and light petroleum, shows 1 part in 200,000; the modified process, purifying the residue by means of benzene, instead of a mixture of ether and light petroleum, shows 1 part in 100,000 only.

L. DE K.

New Fat Extraction Apparatus. By W. JERWITZ (*Chem. News*, 1901, 83, 229).—The apparatus will be readily understood from the accompanying figure. It is also supplied with two specially constructed clamps, which may be fastened to a

wooden partition or to a board fixed to the wall; these clamps, which give a safe, but not absolutely rigid, grip, allow the apparatus to be rotated on its long axis, and it need not again be taken from its stand when it has been once fixed.

The flask, *F*, is attached to the bottom end of the apparatus with an ungreased joint by means of spiral springs. The cartridge, which contains the material to be extracted, is placed in *A*, and after closing the stopcock, *B*, the extractor is filled up to *E* with anhydrous ether. After inserting the glass stopper, *H*, which for safety is also held by two spiral springs, the cock is opened at *B*, and the ether saturated with fat flows from *A* into *F*.

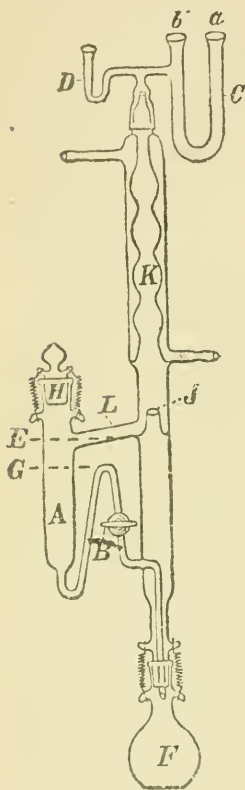
The flask, *F*, which has no external support, is now heated in a water-bath, the temperature of which is kept constant. The ether distils off through *J* into the condenser, *K*, and is condensed; it is prevented from flowing back through *J* into *F*, but flows through *L* into *A*, where it again acts on the cartridge, and presently flows off into *F*.

When the extraction is complete, *B* is closed again, and the ether collects in *A*. When it has all distilled over, *F* is removed, and the ether is allowed to flow through *B* into another vessel; the cartridge is then removed with a pair of tongs.

The condenser is connected with two U-tubes; the larger one, *C*, containing calcium chloride, is closed at *a* by a stopper of wadding, but is made air-tight at *b*. *D* contains a mercury trap in case the calcium chloride tube should become choked, and acts as a safety valve.

L. DE K.

Apparatus for Estimating Fat. By HOMER J. WHEELER and BURT L. HARTWELL (*J. Amer. Chem. Soc.*, 1901, 23, 338—347).—An improvement on the well-known Knorr apparatus. The improvements may be summarised as follows. The flask is inexpensive and may be readily cleaned, and is connected with the extractor by means of a rubber cup which carries the requisite amount of mercury for sealing. The amount of ether which can collect around the outside of the neck of the flask is reduced to a minimum by adjusting the cup to any point of the neck. The end of the tube from which the condensed ether drops upon the substance is bent, so that the ether will be delivered from the centre and not flow down the glass. By a special



arrangement, extraction tubes or thimbles of different lengths may be used, and the ether collected without much loss in one receptacle after the end of the extraction without disconnecting the apparatus, and the ether is, moreover, maintained in a dry condition. For full details of the apparatus, which may be used either singly or in battery form, the original article and drawings should be consulted. L. DE K.

Hübl's Iodine Solution. By MORIZ KITT (*Chem. Zeit.*, 1901, 25, 540).—The author states that Hübl's solution may be rendered more stable by boiling it for 1 hour in a reflux apparatus. It then loses about two-thirds of its available iodine, but the resulting liquid does not undergo further decomposition in the cold for about 8 days.

L. DE K.

The Maumené Test for Oils. By C. AINSWORTH MITCHELL (*Analyst*, 1901, 26, 169—175).—The author has modified Maumené's process so as to render it suitable for oils which develop too much heat on adding sulphuric acid. Two grams of the oil are weighed into a vacuum jacketed tube (*Abstr.*, 1895, ii, 427), 10 grams of carbon tetrachloride are added, and then 2 c.c. of sulphuric acid. The mixture is stirred with a delicate thermometer and the rise in temperature noticed. The rise depends greatly on the strength of the acid, and even when using a 98 per cent. acid the results with unoxidised linseed oils are too low. The fatty acids of 25 different oils were treated with 93.8 per cent. acid, and the rise in temperature is tabulated. This rise, multiplied by 7, gives figures agreeing fairly well with the iodine figures of the fatty acids. The table also shows the thermal rise with bromine and the corresponding iodine value obtained by multiplying by 6.

A similar table is given for the fats themselves. When using 93.8 per cent. acid, the factor for the conversion into the iodine figure is 6.35; when using a 97.8 per cent. acid it is 4.3. The article may be summarised as follows: The Maumené figures obtained by the author's process are in direct proportion to the bromine thermal value of the fatty acids of most unoxidised oils, excepting castor oil, butter, and animal fats rendered at a high temperature. This relationship also applies, although in a less degree, to the glycerides. L. DE K.

Influence of the Season and Feeding on the Reichert-Meissl Number of Dutch Butter. By A. J. SWAVING (*Zeit. Nahr.-Genussm.*, 1901, 4, 577—585).—A very elaborate investigation as to the amount of volatile fatty acids contained in Dutch butter, which from natural causes may occasionally give a somewhat low Reichert-Meissl figure. It is noticed that this is generally accompanied by an increased "Crismer" number. L. DE K.

A New Reaction of Acetone. By MAXIMILIAN STERNBERG (*Chem. Centr.*, 1901, i, 1270; from *Centr. Physiol.*, 25, 69—70).—Solutions of acetone, slightly acidified with phosphoric acid and treated with copper sulphate and iodine dissolved in potassium iodide, give, on warming, an abundant greyish-white precipitate. The reaction is very sensitive, although less so than that of Lieben. Alcohol only

gives the reaction on long boiling; acetophenone, benzaldehyde, and similar compounds do not produce it. Normal urine, free from acetone, gives a similar reaction, but acetone in urine may be detected by employing the distillate.

M. J. S.

New Method of Testing "Saccharin." By CARL GLÜCKSMANN (*Chem. Centr.*, 1901, ii, 58—59; from *Pharm. Post*, 1901, 34, 234).—The chief impurity of commercial "saccharin" is *p*-sulphaminobenzoic acid, which has no sweetening power, and may occur to the extent of 40 per cent. In the absence of other impurities, the amount of true "saccharin" may be estimated by taking advantage of the difference in the molecular weight of those two substances; 1 gram of "saccharin" requires for neutralisation 54.6, and 1 gram of *p*-sulphaminobenzoic acid 49.7 c.c. of *N*/10 sodium hydroxide. Three to 5 grams of the suspected sample are dissolved in 90—150 c.c. of alcohol and titrated, with phenolphthalein as indicator. From the amount of sodium hydroxide consumed, the relative proportion of "saccharin" and the adulterant is easily calculated.

L. DE K.

Estimation of "Saccharin" in Alimentary Substances. By H. DÉFOURNEL (*J. Pharm.*, 1901, [vi], 13, 512—515).—The methods of Allen and of Girard for the detection of "saccharin" are not well adapted for its quantitative estimation. "Saccharin," however, when treated in the cold with ammonia, yields the compound $C_6H_4 \begin{smallmatrix} CO \\ \diagup \quad \diagdown \\ SO_2 \end{smallmatrix} > N \cdot NH_4$, which, like other ammonium compounds, is decomposed by sodium hypobromite with liberation of nitrogen. The liquid to be analysed (250 c.c.) is therefore strongly acidified with 10 per cent. sulphuric acid, and shaken three times with 50 c.c. of a mixture of equal parts of ether and light petroleum. The ether-petroleum extract is thoroughly washed with water to remove acids, and then evaporated. The residue is treated with ammonia, the excess of which is expelled by heating on the water-bath. It is then dissolved in a few c.c. of water, and the solution decomposed by hypobromite in an ureometer. The number of c.c. of nitrogen divided by 0.89 gives the weight of "saccharin" in centigrams.

M. J. S.

Composition of Jellies and Jams. By L. M. TOLMAN, L. S. MUNSON, and W. D. BIGELOW (*J. Amer. Chem. Soc.*, 1901, 23, 347—353).—Tables are given showing the results of the analyses of a large number of fruits and their juices, also of the jams and jellies prepared from them in the ordinary way. The analysis is restricted to total solids, ash, total acidity expressed as sulphuric acid, proteids, reducing sugars, sucrose, and also the polarisations before inversion at 18°, and after inversion both at 18° and at 86°. The rate of inversion of the added sucrose is not only influenced by the amount of free organic acid and time of boiling, but also by the nature of the organic acid.

L. DE K.

General and Physical Chemistry.

Radio-activity of Salts of Radium. By P. CURIE and A. DEBIERNE (*Compt. rend.*, 1901, 133, 276—279).—Radio-activity may be communicated to distilled water by (1) distillation of a solution of radium chloride which has been allowed to stand several days; (2) placing a solution of a radium salt and distilled water in separate dishes in a perfectly closed space, (3) immersing in distilled water a celluloid capsule containing a solution of a radium salt. Such water may exhibit greater radio-activity than the substance from which it was prepared, but loses its power rapidly in an open vessel, and in the space of a few days if the vessel is kept closed. A solution of a radium salt also soon loses its activity in the open air, but regains it if transferred to a sealed tube. The author therefore considers that the radio-active energy may be transmitted by radiation, and also by a kind of conduction, whereby it passes from place to place by means of a gas or liquid, but not ordinarily through solids. A solution of a radium salt is hence in a state of equilibrium, and in a sealed tube, the loss of activity by radiation being slight, the value of the activity is high, but in an open vessel, the loss by conduction being considerable, the activity is very feeble. L. M. J.

Electromotive Efficiency of the Elementary Gases. II. By EMIL BOSE (*Zeit. physikal. Chem.*, 1901, 38, 1—27. Compare Abstr., 1900, ii, 704).—The author concluded from his earlier work (*loc. cit.*) that the *E.M.F.* of Grove's gas cell has a higher value than is usually assigned to it. Besides the confirmation of this in Wilsmore's investigation (this vol., ii, 2), the author has himself found the value 1.1242 volts as a lower limit for the *E.M.F.* If the electrodes are polarised for a lengthened period with small current density so that they become super-charged with the gases, a series of determinations made as the cell depolarises reveals an upper limit value for the *E.M.F.*, namely, 1.1542 volts. The length of time required to effect this super-saturation shows that the ordinary charging of such electrodes can be merely superficial.

At the oxygen electrode of the Grove cell there is equilibrium between water, oxygen, and hydrogen peroxide. To this hydrogen peroxide, if its concentration be high enough, there corresponds a higher oxidation potential than that of oxygen under atmospheric pressure; the addition of ordinary hydrogen peroxide, however, to the electrolyte at an oxygen electrode lowers the potential, as observed by Glaser (Abstr., 1899, ii, 78), and Wilsmore (*loc. cit.*). When the hydrogen peroxide equilibrium just referred to has been established, rise of temperature lowers the potential to a value less than that for oxygen alone; this corresponds probably with the conversion of one hydrogen peroxide modification into another. So long as the theory

of the gas cell deals only with states of equilibrium, it need not be modified on account of the part played by the hydrogen peroxide.

J. C. P.

Electromotive Efficiency of the Elementary Gases. III. Observations relative to a new Electrode Sensitive to Light. By EMIL BOSE & HANS KOCHAN (*Zeit. physikal. Chem.*, 1901, 38, 28—55. Compare preceding abstract, and Bose, Abstr., 1900, ii, 704).—A cell with gold electrodes and sulphuric acid as electrolyte was polarised for seventeen days. During the process, the cathode became coated with a brownish deposit like finely divided gold, whilst on the anode an orange-coloured skin appeared, gradually becoming more powdery and falling to the bottom of the vessel. When the cell was left to itself, it was found that the *E.M.F.* showed remarkable periodic variations, being higher in the dark than in the light, and when it was kept entirely in the dark, the variations ceased. Experiments with an arc lamp showed that the oxygen electrode was the sensitive one. Daylight, electric light, magnesium light, and the light from an incandescent gas lamp all lower the oxidation potential at the anode; violet light has the same effect, but red light raises the potential; sodium light has practically no effect. The *E.M.F.* varies to the extent of 0.1 volt, according to the nature of the light.

J. C. P.

Polarisation of Magnesium in Alkaline Solutions. By ADOLFO CAMPETTI (*Atti Accad. Sci. Torino*, 1900—1901, 36, 427—432).—When employed as anode in an electrolytic cell containing sodium or potassium hydroxide solution, magnesium shows a behaviour similar to that already noticed for aluminium (compare Graetz, Abstr., 1898, ii, 10), a great decrease in the current being produced, probably owing to the formation of a film of oxide on the surface of the aluminium.

T. H. P.

Electrolysis of Molten Lead Iodide and Lead Chloride with particular Reference to the Application of Faraday's Law and the Theory of the Electrolysis of Molten Salts. By GUSTAV AUERBACH (*Zeit. anorg. Chem.*, 1901, 28, 1—44).—Fused lead iodide at temperatures varying from 440° to 800° was electrolysed by a current of 24 volts and 1 to 2 amperes. The amount of lead separated at the lowest temperature was only about 90 per cent. of that which the current should form, and varied greatly in different experiments. As the temperature rises, the yield becomes smaller. Faraday assumed that during the course of the electrolysis, lead tetraiodide, PbI_4 , was formed, but the author finds no evidence in favour of this view.

In the electrolysis of lead chloride also, the quantity of lead separated falls short of the possible amount. Determination of the quantity of chlorine formed proves conclusively that the carbon electrodes (and to a slight extent the undecomposed salt) absorb chlorine, and consequently the evolution of chlorine depends on the duration of the electrolysis. After the process has gone on for some time and the carbon has become saturated, the quantity of chlorine liberated is nearly exactly (above 99 per cent.) equal to the amount required by Faraday's law.

This is the first time that Faraday's law has been proved for the *anode* in the case of a molten salt.

Lorenz (*Zeit. anorg. Chem.*, 1900, 23, 97) has suggested that the formula $a = 100.\epsilon'/\epsilon$ represents the yield of the current (a), where ϵ is the polarisation of the molten salt, and ϵ' the depolarised value of the same. During the above experiments, the polarisation was also determined, and it has been found that Lorenz's formula, although not rigorously exact, gives approximate values.

When the lead chloride is mixed with lead oxide, the yield is precisely the same as when fused lead chloride alone is used, but no chlorine or oxygen is evolved.

During the electrolysis, a metallic "cloud" is given off from the cathode, and spreads through the fused mass. As it comes near the anode, it combines with the free chlorine there, and in this way gives rise to the irregularities in the amount of metal deposited, since the amount dissipated as "cloud" must vary greatly, with slight modifications of external circumstances. The "cloud" was examined by Tyndall's method, and it was proved that it is not formed of solid particles but is a true solution of the metal in the fused salt, which fact is confirmed by the circumstance that metallic cadmium may be crystallised from its fused chloride.

J. McC.

Electrolytic Short Circuits in Liquid Cells. By OTTO SACKUR (*Zeit. Elektrochem.*, 1901, 7, 781—784).—The author has measured the *E.M.F.* of concentration cells containing electrodes of silver covered with silver chloride immersed in solutions containing different quantities of the chloride, and the same quantities of the nitrate of a metal. Potassium, lithium, and hydrogen salts are used. The *E.M.F.* of such a cell is made up of three single *P.D.*; the values of the two existing between the electrodes and the solutions depend only on the concentrations of the chlorine ions in the solutions. The difference between the *E.M.F.* of two cells containing salts of different metals, but having the same concentrations with respect to chlorine ions, is therefore due to the difference of the *P.D.* at the junctions of the solutions.

The values of these *P.D.* may be calculated from Nernst's theory (Abegg and Bose, *Zeit. physikal. Chem.*, 1899, 30, 545). The results of the author's experiments are in good agreement with those calculated from the theoretical formula.

T. E.

Dissociation of Strong Electrolytes. By OTTO SACKUR (*Zeit. Elektrochem.*, 1901, 7, 784—787).—Jahn's view that the deviation of strong electrolytes from the dilution law is due to changes of ionic mobility with concentration is discussed. By means of Jahn's values for these mobilities (*Zeit. physikal. Chem.*, 1900, 35, 9), the author calculates the conductivities of solutions containing equal quantities of hydrochloric acid and potassium chloride, and of sodium and potassium chlorides, and finds that the calculated conductivity is 2 to 3 per cent. larger than that found. He is therefore of opinion that Jahn's conclusions are erroneous. Jahn has, however, already withdrawn them (*ibid.*, 1901, 37, 490).

T. E.

[Degree of Dissociation and Dissociation Equilibrium in the case of Highly Dissociated Electrolytes.] A Correction. By HANS JAHN (*Zeit. physikal. Chem.*, 1901, 38, 125—126).—In regard to the new dissociation isotherm deduced in his recent paper (this vol., ii, 491), the author, whilst holding to the correctness of his theoretical treatment, acknowledges that the numerical data employed to test the theory are quite useless; it is not admissible to explain deviations from the simple gas laws with the help of numbers obtained on the hypothesis that these laws are valid. There is at present no satisfactory method of determining the ionic concentration in cases where the gas laws do not hold. J. C. P.

Electro-capillary Action of Non-dissociated Molecules. By A. GOUY (*Compt. rend.*, 1901, 133, 284—287).—An extension of the previous paper (this vol., ii, 435); curves are given for *E.M.F.* against *h* (where *h* is the height of the electro-capillary column), in the case of a solution of sodium sulphate, and of the same solution with the addition of the organic compound. The effect of the latter is in all cases to cause a depression of *h*, most marked towards the middle of the curve, and becoming *nil* at the extremities. In this, the organic compounds differ from electrolytes, and hence, also, active molecules from active ions, as the latter cause a depression which increases from the positive side. The curves obtained with organic compounds, however, fall into certain groups, the discussion of which is deferred.

L. M. J.

Calculation of Heats of Dilution, according to Kirchhoff's Formula. By FERENCZ JÜTTNER (*Zeit. physikal. Chem.*, 1901, 38, 76—118).—In a review of the work done on this subject, and on the relation between theory and von Babo's law, the author points out that only in one case (Ewan and Ormandy, *Trans.*, 1892, 61, 769) has the calculation of heats of dilution by Kirchhoff's formula been successfully carried out. The calculation involves the expression $\log(P_0/P)$, where P_0 and P are the vapour pressures of solvent and solution, respectively, at the same temperature. Instead of direct vapour pressure determinations, the author uses published data regarding freezing and boiling points, and from these, calculates the values of the above expression. The solvents dealt with are water, benzene, and glacial acetic acid. Only for aqueous solutions of potassium chloride and nitrate—cases where the experimental data are exact and complete, and where the heat of dilution does not change its sign between 0° and 100°—was there quantitative agreement between the values of the heat of dilution calculated for the mean temperature of 50° and those obtained by experiment. In other cases, a qualitative agreement was found, but as a general rule, the experimental data are very defective. The author himself has determined the boiling points of aqueous solutions of sucrose, dextrose, levulose, citric acid, and tartaric acid over a large range of concentration. J. C. P.

Latent Heat of Evaporation of Steam from Saturated Salt Solutions. By FREDERICK T. TROUTON (*Trans. Roy. Irish Acad.*, 1900, 31, 345—362).—With an apparatus similar to that used by

Marshall and Ramsay (*Phil. Mag.*, 1896, 41, 38), the author has determined the latent heat of evaporation of steam from saturated solutions of sodium nitrate, sodium sulphate, and calcium chloride. The two former boil at 121° and 103.5° respectively, and the values of the latent heat are 478.3 and 529; these salts dissolve with absorption of heat, hence the latent heat is less than in the case of pure water. Calcium chloride is of the opposite type, dissolving with development of heat; as it does not give a solution of maximum boiling point, three different solutions were used, boiling at 140° , 120° , and 103° respectively; the values of the latent heat obtained were 683, 606, and 545; these values point to the latent heat being a linear function of the temperature. The relation between the latent heat of evaporation and the heat of solution in the case of sodium nitrate has been calculated by means of a thermodynamic cycle, and satisfactorily checked by an actual estimation of the heat of solution. J. C. P.

Vapour Tension of Solutions. Arrhenius' Hypothesis. By A. PONSOT (*Compt. rend.*, 1901, 133, 341—344).—From a consideration of the equilibrium of the system $\text{Zn} + \text{H}_2\text{SO}_4 \rightleftharpoons \text{H}_2 + \text{ZnSO}_4$, the author deduces the following generalisation: "If, in a solvent which takes no part in the chemical reaction, the substitution of *A* for *B* in the compound *BC* develops heat, then the vapour tension is higher when the solvent contains any quantity of *AC* than when it contains the equivalent quantity of *BC*." Hence it must also follow that the molecular depression of the freezing point is less for the compound *AC* than for *BC*. This conclusion, although not in accord with Arrhenius' hypothesis, in which the cryoscopic modulus, &c., is independent of the nature of the radicle, is not contradicted by the experimental observations of cryoscopic depressions, or of the vapour pressure of saline solutions. L. M. J.

Thermal Study of the Solid Hydrates of Potassium Hydroxide. By ROBERT DE FORCRAND (*Compt. rend.*, 1901, 133, 157—159).—The heats of dissolution of samples of potassium hydroxide containing various quantities of combined water show that besides the compounds KOH and $\text{KOH}, 2\text{H}_2\text{O}$ there exist two intermediate hydrates, $\text{KOH}, \frac{1}{2}\text{H}_2\text{O}$ and $\text{KOH}, \text{H}_2\text{O}$. The heat of fixation of the first half-mol. of water to KOH sol. is +6.30 Cal., and that of the second half-mol. +3.15 Cal., the heat developed on passing from $\text{KOH}, \text{H}_2\text{O}$ to $\text{KOH}, 2\text{H}_2\text{O}$ being +3.04 Cal. The values for the addition of a whole mol. of water in the three cases are 12.60, 6.30, and 3.04 respectively: numbers which stand in the simple ratio, 4:2:1.

W. A. D.

Thermal Properties of Solid Hydrates of Sodium Hydroxide. By ROBERT DE FORCRAND (*Compt. rend.*, 1901, 133, 223—226).—The following heats of dissolution were obtained, NaOH +10.305 Cal.; $\text{NaOH} + 0.32\text{H}_2\text{O}$, +9.15 Cal.; $\text{NaOH} + 0.525\text{H}_2\text{O}$, +8.08 Cal.; $\text{NaOH} + 0.644\text{H}_2\text{O}$, +7.22 Cal.; $\text{NaOH} + 0.821\text{H}_2\text{O}$, +6.18 Cal., and $\text{NaOH} + \text{H}_2\text{O}$, +5.20 Cal. The results indicate the existence of a hydrate $3\text{NaOH}, 2\text{H}_2\text{O}$ in addition to the hydrate $\text{NaOH}, \text{H}_2\text{O}$, but there is no evidence of the formation of any intermediate hydrates.

As in the case of potassium hydroxide, combination with the first quantities of water develops less heat than combination with subsequent quantities. Anhydrous potassium hydroxide is more hygroscopic than anhydrous sodium hydroxide, but after some water has been taken up, the sodium hydroxide becomes the more hygroscopic of the two. The curves of the heats of dissolution cross at a point corresponding with $\text{KOH}, \frac{1}{3}\text{H}_2\text{O}$ and $\text{NaOH}, \frac{1}{3}\text{H}_2\text{O}$, but beyond this point the heat of dissolution of the sodium compound is higher than that of the corresponding potassium compound.

C. H. B.

The Boiling Point Curve of Mixtures of Ethyl Alcohol and Water. By WILLIAM A. NOYES and R. R. WARFEL (*J. Amer. Chem. Soc.*, 1901, 23, 463—468).—The boiling points of mixtures of alcohol and water in proportions varying by 0.5 per cent. of alcohol have been determined. The mixture of lowest boiling point (78.174°) is that which contains 96 per cent. by weight (97.45 per cent. by volume) of alcohol. A mixture containing 90.7 per cent. (by weight) of alcohol has the same boiling point (78.300°) as absolute alcohol.

J. McC.

Solubility of Mixtures of Copper Sulphate and Sodium Sulphate. By GUSTAVE MASSOL and MALDÈS (*Compt. rend.*, 1901, 133, 287—289).—It has been shown by Rudorff that at 15° the composition of a solution of copper sulphate (A) and sodium sulphate (B) remains invariable if both salts are in excess. The author has extended the research to temperatures of 10° , 30° , and 50° , and has found the compositions of the solutions when the salts are mixed respectively in the molecular proportions of (I) 3 : 1, (II) 1 : 1, (III) 1 : 3. The results obtained are given in the following table :

	10° .		15° .		30° .		50° .	
	A.	B.	A.	B.	A.	B.	A.	B.
I.....	19.75	12.49	20.69	15.88	22.03	16.36	32.37	11.75
II.....	19.70	12.50	20.75	15.90	21.00	20.14	31.45	13.41
III.....	19.69	12.55	20.70	15.92	15.28	22.70	28.76	15.25

It is seen that at higher temperatures the composition of the solution varies with the relative quantities of the salts, although both are present in excess.

L. M. J.

Molecular Weights at the Boiling Point. By ROBERT DE FORCRAND (*Compt. rend.*, 1901, 133, 368—371).—The law that the heat of solidification of the molecule of a gas is proportional to the absolute temperature of its boiling point at normal pressure (this vol., ii, 372) may be expressed by the equation $(L + S)/T = K = (30)$, where S is the latent heat of fusion and L the latent heat of vaporisation. This law, which has been verified for a number of substances, may be employed to find the molecular weight, and hence the molecular complexity of compounds at the boiling point. The following values for the latter constant are thus obtained. Bromine, 2.07; acetic acid, 1.61; iodine, 3; mercury, 1.18; sulphur, 8.31; nitric acid, 1.37; nitrogen pent-

oxide, 0.74. These results are in accord with those obtained by other methods, the values for iodine and sulphur agreeing with those of Oddo and Serra (Abstr., 1900, ii, 73). L. M. J.

Maxwell's Law $K=n^2$ in Reference to the Molecular Structure of Substances. By A. BATSCINSKI (*Zeit. physikal. Chem.*, 1901, 38, 119—121).—The expression $\mu = (K-1)/(K+2)$ in Mossotti's theory of dielectrics is based on two assumptions; (1) that the particles of the substance are spherical, (2) that they do not touch. The formula fails in those cases where $K > n^2$. The author, in this preliminary paper, shows that if a number of particles touch each other and lie on the surface of a sphere, K is greater than n^2 ; the difference $K-n^2$ is greater or smaller according as the sphere is hollow or filled completely with the particles of the substance. Such an aggregation of particles is supposed to exist in liquids which are undoubtedly associated; these liquids, for example, water, the alcohols, and the organic acids, generally have a large value for K . In liquids that are non-associating, and yet have a large value of K , there may be an arrangement of the atoms similar to that of the molecules described above. J. C. P.

Chemical Processes in the System: Ether—Water—Hydrogen Chloride. By FERENCZ JÜTTNER (*Zeit. physikal. Chem.*, 1901, 38, 56—75).—As was observed by Schuncke (Abstr., 1894, ii, 378), ether is more soluble in an aqueous solution of hydrogen chloride than in pure water, and its solubility rapidly increases as the concentration of the hydrogen chloride rises. Since the addition of an electrolyte to a solvent generally has the opposite effect on its dissolving power (compare Rothmund, Abstr., 1900, ii, 467), it may be supposed that ether forms a compound with hydrogen chloride. All excess of ether can be expelled from its solution in hydrochloric acid by distillation or by shaking with much water, but this does not disprove the existence of a compound; these processes simply upset the equilibrium (compare the effect of distilling an aqueous solution of ferric chloride). Analogy makes it probable that a compound of ether and hydrogen chloride does exist, for the compounds $\text{Et}_2\text{O} \cdot \text{HI}$ and $\text{Me}_2\text{O} \cdot \text{HCl}$ are known. The author shows that the phenomena of the partition of hydrogen chloride between water and ether can be explained only by the existence of such a compound, and proves that this compound must be much more soluble in water than in ether, hence the increased solubility of ether in hydrochloric acid. The application of the law of mass action and van't Hoff's formula, $2\log_e(K_2/K_1) = q\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$, makes it probable that the formula is $[\text{Et}_2\text{O} \cdot \text{HCl}]_2$, although this cannot be definitely proved. In this compound, ether acts like a basic substance, and its ability to do so is attributed to the presence of quadrivalent oxygen; the case is parallel to that of dimethylpyrone hydrochloride (Collie and Tickle, Trans., 1899, 75, 710), and tetramethylpyrone hydrochloride (Collie and Steele, Trans., 1900, 77, 961). J. C. P.

The Colour of Ions. By G. VAILLANT (*Compt. rend.* 1901, 133, 366—368).—Colorimetric observations with a Gouy spectro-

photometer have shown that in solutions of the permanganates of potassium, zinc, and barium, the colour is solely dependent on the concentration of the MnO_4^- ion.

L. M. J.

Paralysis of Platinum Catalysis by "Poisons." By GEORG BREDIG (*Zeit. physikal. Chem.*, 1901, 38, 122—124).—The author argues that Raudnitz's experiment (this vol., ii, 496) on the 'poisonous' action of hydrocyanic acid does not justify the conclusion that the catalyser is not affected by 'poisons.'

J. C. P.

Model of the Nitrogen Atom demonstrating the Stereoisomerism of the Oximes. By EDGAR WEDEKIND (*Annalen*, 1901, 318, 117—120).—The quinquivalent nitrogen atom is represented as occupying the centre of gravity of a pyramid with a square base. Three out of the four valencies represented by lines passing through to the basal angles of the pyramid are utilised in compounds of tervalent nitrogen. Two of these valencies being satisfied by the aldehydic or ketonic carbon atom of the oxime, one or other of the two remaining basal angles may be selected to carry the hydroxyl group, thus giving rise to *syn*- and *anti*-isomerides.

G. T. M.

Improved Electric Furnace for Laboratory Use. By SAMUEL AUCHMUTY TUCKER and HERBERT R. MOODY (*J. Amer. Chem. Soc.*, 1901, 23, 473—476).—The furnace described is of the Moissan type. For details, reference must be made to the original paper.

K. J. P. O.

Some Modified Forms of Physico-chemical Measuring Apparatus. By ALLERTON S. CUSHMAN (*J. Amer. Chem. Soc.*, 1901, 23, 482—485).—In order to fix the electrodes more securely in the Kohlrausch-Ostwald conductivity cell, the glass supports are fixed in the ebonite cover by means of brass set-screws with ebonite tips. This arrangement is more perfect than the ordinary one in which the supports are merely fixed by friction.

An improvement of the Ostwald burette calibrator is described, in which the pipette is provided with an etched scale. The pipette is filled to the lowest mark and the burette emptied into it from the zero mark down to 2 c.c.; the volume of this is noticed on the scale of the pipette and may be taken as the standard. The pipette is emptied to the lowest mark, and water again admitted from the burette until the meniscus stands at the 4 c.c. mark. A series of readings is made in this way, and a similar series starting at the 1 c.c. mark on the burette, and the corrections are introduced in the ordinary way. By this process, the exact standardisation of the pipette by the method of weighing is avoided.

J. McC.

Inorganic Chemistry.

Physical Properties of Liquid and Solid Hydrogen. Separation of Free Hydrogen and other Gases from Air. Experiments on the Liquefaction of Helium at the Melting Point of Hydrogen. Pyroelectricity, Phosphorescence, &c. By JAMES DEWAR (*Proc. Roy. Soc.*, 1901, 68, 360—366).—A helium thermometer has given $20\cdot5^{\circ}$ absolute as the boiling point, and 16° absolute as the melting point, of hydrogen (compare *Trans.*, 1898, 73, 534; *Abstr.*, 1899, ii, 741; this vol., ii, 308). The lowest temperature recorded in gas thermometry is $14\cdot5^{\circ}$ absolute, but with solid hydrogen, with more complete isolation and lower pressure of exhaustion, it will be possible to reach 13° .

The latent heat of liquid hydrogen at its boiling point, as deduced from the vapour pressures and helium-thermometer temperatures, is about 200 units, and the latent heat of solid hydrogen is not greater than 16 units.

From (1) the percentage of liquid hydrogen which has to be quickly evaporated in order to reduce the temperature to the freezing point, and (2) the latent heat of evaporation, the average specific heat of liquid hydrogen between freezing and boiling points has been found to be about 6. It thus appears that hydrogen obeys Dulong and Petit's law, and has a greater specific heat than any other known substance.

The surface tension of hydrogen at its boiling point is about one-fifth that of liquid air under similar conditions, and about $1/35$ that of water at the ordinary temperature.

Experiment gives 1.12 as the refractive index of liquid hydrogen, whilst the calculated value is 1.11. Thus the refractivity of hydrogen, like that of liquid oxygen and nitrogen, is in accordance with theory.

Hydrogen, helium, and neon have been separated from air by two methods. By one of these, a crude, uncondensed residue was obtained amounting to $1/34000$ of the volume of air liquefied; this residue contained 32.5 per cent. of hydrogen, 8 per cent. of nitrogen, and 60 per cent. of helium, neon, &c. After removal of the hydrogen and nitrogen, the neon can be solidified by cooling in liquid hydrogen. When a current of air is passed through a spiral filled with glass wool and immersed in a liquid air-bath, the condensed gas consists mostly of xenon: if the bath is kept at a slightly lower temperature by exhaustion, and the pressure of the air current suitably reduced to prevent liquefaction, krypton is deposited along with the xenon.

Comparative experiments made with hydrogen and helium in a Cailletet apparatus seem to indicate that the critical temperature of helium is under 9° absolute. It is certain that helium has been cooled to that temperature without any appearance of liquefaction. But the author points out that the refractive index of liquid helium at about its boiling point will be about 1.03, and that, therefore, small drops of liquid helium forming in the gas near its critical point will not easily be

seen. In order to liquefy helium, the process which was successful in the case of hydrogen will have to be applied, only liquid hydrogen under exhaustion will have to be used as the primary cooling agent instead of liquid air. Experience of the cooling effect produced by the regenerating process shows that the use even of liquid helium, with a probable boiling point of 5° absolute, would not enable us to reach the absolute zero. To reach the temperature of 1° , another gas would have to be found as much more volatile than helium as the latter is than hydrogen.

The phosphorescence effects observed when organic substances are cooled by the use of liquid air are much more marked when liquid hydrogen is employed. When zinc sulphide is cooled to 21° absolute and exposed to light, it shows brilliant phosphorescence on the temperature rising. The intensity of photographic action is halved by lowering the temperature from that of liquid air to that of liquid hydrogen. Remarkable electrical and luminous effects are developed by placing certain crystals (especially of some platinoeyanides and of uranium nitrate) in liquid hydrogen.

J. C. P.

Separation of the least Volatile Gases of Atmospheric Air, and their Spectra. By G. D. LIVEING and JAMES DEWAR (*Proc. Roy. Soc.*, 1901, 68, 389—398. Compare this vol., ii, 213).—When the less volatile portions of liquid air are allowed to evaporate gradually at a slowly rising temperature, and the gas given off is spectroscopically examined from time to time, the spectra of argon, krypton, and xenon are observed in the order given. Full details are given in the paper of the apparatus used in the distillation and separation of xenon and krypton, and the wave-lengths of their rays are tabulated in full. Most prominent in the xenon spectrum are four orange rays, a group of very bright green rays, and several very bright blue rays. The krypton lines given coincide closely with those in Runge's list, but are more numerous than the latter.

J. C. P.

Occurrence of Nitrogen and Helium in Uranium Minerals. By VOLKMAR KOHLSCHÜTTER (*Annalen*, 1901, 317, 158—189. Compare Tilden, *Abstr.*, 1898, ii, 383; Gautier, this vol., ii, 171, 398).—This communication contains a summary of the work of earlier investigators and an account of experiments made with the view of determining the state in which nitrogen and helium exist in minerals.

In preparing finely divided uranium, it was found that its two lower oxides behave very differently towards reducing agents; the dioxide, UO_2 , is not reduced when heated with magnesium or aluminium powder, whilst the green oxide, U_3O_8 , reacts very violently with these reagents, the reduction being conveniently moderated by the addition of a certain amount of the lower oxide. When aluminium is employed, it is advisable to use a priming of magnesium or of barium or sodium peroxide.

The *nitride*, U_3N_4 , produced when this reduction is conducted in an atmosphere of nitrogen, is exceptionally stable at high temperatures and is not attacked by solutions of the alkali hydroxides or by concentrated sulphuric or hydrochloric acid; fusion with potash results in the elimination of the nitrogen in the form of ammonia. The gaseous

constituent is evolved in the free state on heating the nitride with oxidising agents, this result being also produced in the presence of steam, ferric oxide, copper oxide, and the oxide U_3O_8 . The compound remains unchanged when heated in a current of nitrogen, but in contact with hydrogen at high temperatures a small amount of ammonia is produced; when burnt in oxygen, the nitride leaves a residue of pure U_3O_8 . This nitride is black, whereas the product obtained by heating uranium in an atmosphere of nitrogen at 1000° is stated by Moissan to be yellow.

The yield of yellow thorium *nitride*, Th_3N_4 , obtained by substituting thorium dioxide for the uranium compound in the preceding reduction is comparatively small; under these conditions of experiment, a considerable amount of dioxide remains unreduced, and since it passes into solution on treating the fused mass with water, it probably exists in the product in the form of a magnesium thorate. This nitride differs markedly from the isomeride prepared by Matignon (this vol., ii, 60 and 106); it is not decomposed by water or dilute acids, and when heated to dull redness in air or oxygen it burns with a luminous flame.

The name *metanitride* is suggested for the new compounds obtained from the metals while in the nascent state; these products are probably identical with the corresponding nitrides existing in the uranium minerals. Nitrogen is evolved on heating these minerals because of the oxidising action of the oxides (Fe_2O_3 , U_3O_8 , &c.), which are always present.

Certain experimental results seem to indicate that helium exists in these minerals in a similar state of combination, its compounds, like the above nitrides, being decomposed by the action of the oxides at high temperatures. For example, the helium in samarskite is completely eliminated when the mineral is heated in carbon dioxide, but only a portion of the gas is evolved when the experiment is conducted in an atmosphere of hydrogen. This difference is readily explained on the assumption that the oxidising agents are reduced by the hydrogen before they can react with the helium compounds.

On the other hand, it was not found possible to synthesise a helium compound by heating the gas in contact with uranium oxide or previously ignited samarskite mixed with aluminium powder, although nitrides are readily produced under these conditions in an atmosphere of nitrogen.

G. T. M.

Compounds of Telluric Acid with Iodates, Phosphates, and Arsenates. By RUDOLPH F. WEINLAND and HUGO PRAUSE (*Zeit. anorg. Chem.*, 1901, 28, 45—70. Compare Abstr., 1900, ii, 399).—A short review is given of the compounds which iodates, phosphates, and arsenates form with acids containing an element of the sixth group (S, Cr, Mo, W).

In addition to the telluriodates previously described, an ammonium tellurimonoiodate, $(NH_4)_2O \cdot I_2O_5 \cdot 2TeO_3 \cdot 6H_2O$, analogous to the potassium and rubidium salts, has been produced by crystallising at the ordinary temperature. It is only at lower temperatures that the salt with $8H_2O$ is formed.

The telluriphosphates are likewise obtained by crystallisation from concentrated solutions of the components. Of these, the following are described: potassium telluridiphosphate, $1.5\text{K}_2\text{O}, \text{P}_2\text{O}_5, \text{TeO}_3, 17.5\text{H}_2\text{O}$, crystallises from the solution below 40° ; in a vacuum, it loses nearly $3/4$ of its water and becomes $1.5\text{K}_2\text{O}, \text{P}_2\text{O}_5, \text{TeO}_3, 4.5\text{H}_2\text{O}$. The rubidium salt is analogous to the second potassium compound. Sodium tellurimonophosphate, $2\text{Na}_2\text{O}, \text{P}_2\text{O}_5, 2\text{TeO}_3, 9\text{H}_2\text{O}$, is best obtained from a solution containing phosphoric acid, telluric acid, and sodium hydroxide in the proportion $2:1:2$. Ammonium tellurimonophosphate, $2(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, \text{TeO}_3, 4\text{H}_2\text{O}$, and ammonium telluritriphosphate, $4(\text{NH}_4)_2\text{O}, 3\text{P}_2\text{O}_5, 2\text{TeO}_3, 11\text{H}_2\text{O}$, are obtained from solutions containing the components in the proportions indicated by the formulæ.

Sodium tellurimonoarsenate, $2\text{Na}_2\text{O}, \text{As}_2\text{O}_5, 2\text{TeO}_3, 9\text{H}_2\text{O}$, ammonium telluridiarsenate, $2(\text{NH}_4)_2\text{O}, \text{As}_2\text{O}_5, \text{TeO}_3, 4\text{H}_2\text{O}$, and ammonium telluriarsenate, $4(\text{NH}_4)_2\text{O}, 3\text{As}_2\text{O}_5, 2\text{TeO}_3, 11\text{H}_2\text{O}$, corresponding with the phosphates, have been prepared, but no potassium or rubidium salts could be obtained.

The crystallographic relationships of all the compounds have been measured.

The authors discuss the constitution of the various compounds in the light of Blomstrand's theory of the constitution of the molybdoiodates (Abstr., 1890, 107).
J. McC.

Decomposition of Sodium Nitrate by Sulphuric Acid. II. By C. W. VOLNEY (*J. Amer. Chem. Soc.*, 1901, 23, 489—492. Compare Abstr., 1892, 941).—When a mixture of sulphuric acid and sodium nitrate is heated at a temperature below 100° until no more nitric acid distils over, the residue in the retort consists of unchanged sodium nitrate and an oil, which, on cooling, crystallises. The crystals have approximately the composition $\text{NaH}_3(\text{SO}_4)_2$. If the mixture is heated at a temperature of 121° until no more acid distils over, the residue consists only of sodium hydrogen sulphate. In the first period of the reaction, pure nitric acid is obtained; in the second period, a somewhat diluted acid is produced.
K. J. P. O.

Cæsium Compounds. By CAMILLE CHABRIÉ (*Compt. rend.*, 1901, 133, 295—297. Compare this vol., ii, 314).—In order to completely decompose pollux, it is advisable to dry the very finely divided mineral at 130° , and then add it to about 100 times its weight of pure hydrofluoric acid. The following salts are described. *Cæsium hydrogen sulphite*, CsHSO_3 , obtained as a white precipitate on saturating an alcoholic solution of the carbonate with sulphur dioxide; *cæsium sulphite*, Cs_2SO_3 , snow-white crystals; *cæsium thiosulphate*, $\text{Cs}_2\text{S}_2\text{O}_3$, colourless needles; *cæsium dithionate*, $\text{Cs}_2\text{S}_2\text{O}_6$, obtained from cæsium sulphate and barium dithionate, large hexagonal plates. All these compounds are readily soluble in water.
J. J. S.

[Non-existence of Ammonium at -95°]. By OTTO RUFF (*Chem. Centr.*, 1901, ii, 391; from *Ber. Deut. pharm. Ges.*, 11, 277—288).—A saturated solution of ammonium iodide in liquid ammonia, cooled to -95° by means of liquid air, was subjected to electrolysis. At the positive pole, nitrogen iodide separated, but at the negative pole only

hydrogen was evolved, being obviously derived from the decomposition of ammonium into ammonia and hydrogen. E. W. W.

Reaction between Chlorine and Ammonia. By WILLIAM A. NOYES and ALBERT C. LYON (*J. Amer. Chem. Soc.*, 1901, 23, 460—463).—It is shown that the normal reaction between ammonia and chlorine is represented by the equation: $12\text{NH}_3 + 6\text{Cl}_2 = \text{N}_2 + \text{NCl}_3 + 9\text{NH}_4\text{Cl}$, the volume of nitrogen being one-sixth that of the chlorine. If the ammonia is present in excess, it reacts with the nitrogen chloride, giving free nitrogen and probably also ammonium hypochlorite, thus: $\text{NCl}_3 + \text{NH}_3 = \text{N}_2 + 3\text{NH}_4\text{Cl}$ and $\text{NCl}_3 + \text{NH}_4\text{OH} + \text{H}_2\text{O} = 3\text{NH}_4\text{ClO}$. If the chlorine is present in excess, the ammonium chloride which is formed reacts with it to some extent, and little or no nitrogen is evolved.

The nitrogen chloride was estimated by extracting the product of the reaction with benzene. The benzene solution was shaken with excess of arsenious oxide dissolved in a solution of sodium hydrogen carbonate, and the excess of the oxide determined by standard iodine. After titration, the ammonia was estimated by distillation. K. J. P. O.

Action of Silver on Hydrogen Bromide and the Inverse Reaction. By JOUNIAUX (*Compt. rend.*, 1901, 133, 228—231).—When silver is heated with hydrogen bromide in sealed tubes, the action is at first rapid, but after a time equilibrium is reached, and is maintained at any given temperature, even if the heating is much prolonged. The action of hydrogen on silver bromide is analogous, and the limiting pressures at a given temperature are identical in the two cases. If hydrogen is introduced at different pressures into the tube containing the silver bromide, the proportion of hydrogen bromide formed when equilibrium is attained at a given temperature, is higher the lower the initial pressure. The results are in accord with the law of the displacement of equilibrium by variations of temperature, and the observed and calculated results agree closely. C. H. B.

Action of Cupric Hydroxide on Solutions of Metallic Salts. By A. MAILHE (*Compt. rend.*, 1901, 133, 226—228).—The cupric hydroxide, $\text{Cu}_2\text{O}_3(\text{OH})_2$, acts on solutions of several metallic bromides and chlorides at the ordinary temperature, yielding crystalline basic double bromides or chlorides. In this way, the following compounds were obtained: $\text{ZnCl}_2, 3\text{CuO}, 4\text{H}_2\text{O}$, small, blue plates or hexagons; $\text{ZnBr}_2, 3\text{CuO}, 4\text{H}_2\text{O}$, green, stellate crystals; $\text{MnCl}_2, 2\text{CuO}, 6\text{H}_2\text{O}$, a green powder consisting of minute hexagons; $\text{CoCl}_2, 3\text{CuO}, 4\text{H}_2\text{O}$, a green, crystalline powder (hexagons); $\text{NiCl}_2, 2\text{CuO}, 6\text{H}_2\text{O}$, a pale green, crystalline powder; $\text{NiBr}_2, 2\text{CuO}, 2\text{H}_2\text{O}$, in green, quadrangular lamellæ, and $\text{CdCl}_2, 2\text{CuO}, 6\text{H}_2\text{O}$, a grey, crystalline powder. The black oxide and the blue hydroxide as a rule yield the same products, but if the liquid is heated, the basic compounds may contain less water of crystallisation. The blue hydroxide, with nickel chloride in the cold, yields the compound $\text{NiCl}_2, 3\text{CuO}, 4\text{H}_2\text{O}$.

Mercuric chloride and bromide are not affected by cupric oxide or hydroxide in the cold, but if boiled with the blue hydroxide, mercuric chloride yields a green, amorphous compound, $\text{HgCl}_2, 3\text{CuO}, \text{H}_2\text{O}$.

C. H. B.

Preparation of pure Cerium Oxide. By JEAN STERBA (*Compt. rend.*, 1901, 133, 221—223).—The method of Wyruboff and Verneuil (*Abstr.*, 1897, ii, 452) can be made more rapid by oxidising the cerous nitrate to ceric nitrate by means of a current of about 0·7 ampere and 2 volts, the liquid containing about 1 per cent. of nitric acid. The ceric oxide is precipitated with ammonia and a small quantity of ammonium sulphate, and the precipitate washed with water containing 5 per cent. of ammonium nitrate and 1 per cent. of ammonium sulphate. The process is repeated until the substance shows no absorption spectrum. Cerium oxide, free from other metals, will show a reddish coloration if it contains small quantities of nitrogen. It is slightly reduced by hydrogen at a high temperature, and is also reduced when heated with zinc, but not when heated with cadmium.

C. H. B.

Crystallised Cerium Oxide. By JEAN STERBA (*Compt. rend.*, 1901, 133, 294—295).—When fused with sodium chloride, borax, or potassium sulphate, cerium oxide forms colourless, transparent cubes, or combinations of cubes and octahedra of sp. gr. varying from 7·314 to 7·995.

J. J. S.

Neodymium Chloride. By CAMILLE MATIGNON (*Compt. rend.*, 1901, 133, 289—291. Compare *Abstr.*, 1900, ii, 142).—*Neodymium chloride*, $\text{NdCl}_3 \cdot 6\text{H}_2\text{O}$, crystallises in large, deliquescent, rose coloured, monoclinic forms. It has a sp. gr. 2·282 at $16\cdot5^\circ/4^\circ$, and the molecular volume 156·9. Its solubility in 100 parts of water is 246·2 parts at 13° and 511·6 at 100° . An aqueous solution saturated at 13° has the sp. gr. 1·741 at $15^\circ/4^\circ$. Its heat of solution is +7·60 Cal.

When dried in a current of dry hydrogen chloride, it yields the hydrate $\text{NdCl}_3 \cdot \text{H}_2\text{O}$, which on further heating above 160° forms the anhydrous chloride, the heat of solution of which is +34·8 Cal. The anhydrous chloride dissolves readily in absolute alcohol, and ebullioscopic and cryoscopic determinations with the solution point to the simple molecular formula NdCl_3 for the substance.

J. J. S.

Supposed Alteration of the Properties of Aluminium. By PIETRO SPICA (*Gazzetta*, 1901, 31, ii, 67—72; *Boll. Chim. Farm.*, 40, 341—345. Compare Le Bon, this vol., ii, 20).—The formation of streaks of alumina when aluminium is shaken with mercury does not take place as a rule in less than two minutes, and when the oxide is removed and the process repeated, the streaks can be obtained only once, or at most twice, more. Water is decomposed only very slowly by aluminium in presence of mercury, and after a time no further decomposition occurs. When strips of aluminium are immersed in water containing a few drops of hydrochloric acid and a very small quantity of mercuric chloride, the formation of alumina may be observed in a few minutes; the strips, when removed from the liquid, oxidise very quickly in the air and decompose water, but after repeating the treatment two or three times they lose both these properties.

E. W. W.

Alloys of Aluminium and Molybdenum. By LÉON GUILLET (*Compt. rend.*, 1901, 133, 291—293. Compare this vol., ii, 512).—The dross from the crystalline alloys previously described (*loc. cit.*),

after treatment with very dilute hydrochloric acid, has yielded further crystalline products. The definite alloys so far isolated are, Al_7Mo , Al_3Mo , Al_2Mo , AlMo , AlMo_4 , and probably AlMo_{20} . The state of division of the aluminium employed in reducing the molybdic acid exercises considerable influence on the composition of the alloys obtained.

J. J. S.

Physical and Chemical Changes in Solutions of Ferric Salts. By EDUARD SCHÄER (*Arch. Pharm.*, 1901, 239, 257—283 and 340—353).—The author describes the effect of dilution and of heat on the colour of solutions of ferric chloride, sulphate, nitrate, and acetate, and compares the colours of aqueous and alcoholic solutions of the same salts at ordinary and higher temperatures. The intensity of reaction of ferric salts with ferrocyanide, thiocyanate, salicylic acid, &c., is diminished by rise of temperature, but increased generally in the presence of alcohol. As pointed out by Schönbein, sulphurous acid intensifies the colour of ferric salt solutions, and the latter thereby acquire an increased power of oxidising and decolorising indigo; these observations have been confirmed and extended by the author. The varied phenomena recorded are arranged at length in tabular form. They are to be explained by two factors: (1) A hydrolytic dissociation of the ferric salt into acid and oxide, (2) an increased reactivity of the oxygen of the ferric oxide from the iron salt.

J. C. P.

Uranyl Nitrate. By F. JANDA (*Chem. Centr.*, 1901, ii, 266; from *Oesterr. Zeit. Berg-Hütt.*, 49, 325—328, and 340—342).—Uranyl nitrate, $\text{UO}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$, is prepared on the large scale by dissolving uranium pentoxide in nitric acid of sp. gr. 1.321. The pentoxide is obtained by igniting ammonium uranate in graphite crucibles. The original paper contains an account of the various phases of the process, the composition of the crude materials, the technical application of the salt, and a *résumé* of previous work.

E. W. W.

Studies on Solutions of Stannous Salts. III. By STEWART W. YOUNG (*J. Amer. Chem. Soc.*, 1901, 23, 450—460. Compare this vol., ii, 318, 390).—*Course of the reaction between stannous chloride and oxygen.* The conductivity of solutions of stannous chloride (0.16*N*) to which varying amounts of hydrochloric acid had been added was determined at 20° after oxidation. The conductivity of such solutions increases slowly, and only after some hours reaches a constant value. This increase, which is very rapid at first, is greater for solutions more concentrated with respect to hydrochloric acid than for those less concentrated. The results obtained when free oxygen, potassium dichromate, ferric chloride, hydrogen peroxide, or sodium hypochlorite was used for the oxidation were all similar. The facts that it requires some considerable time for the equilibrium to be attained, and that the increase in the conductivity is dependent on the concentration of the hydrochloric acid, lead the author to conclude that the first stage in the oxidation of stannous chloride is the formation of stannic chloride for which hydrochloric acid is necessary, and the second stage is the hydrolysis of the stannic chloride.

Kinetics of the reaction between stannous chloride and oxygen. The author discusses the reaction from the point of view that the hydro-

chloric acid takes part in the reaction in the first stage and is a product of the secondary reaction. It is shown that in certain cases the value of dx/dT may reach a maximum in reactions such as this, and Ostwald's statement that such maxima can only occur when catalytic influences are at work is too broad.

J. McC.

Metathorium. By GRÉGOIRE N. WYROUBOFF (*Zeit. anorg. Chem.*, 1901, 28, 90—91).—Stevens (this vol., ii, 391) has taken no account of the work of Wyrouboff and Verneuil (*Bull. Soc. Chim.*, 1899, [iii], 21, 118; also *Abstr.*, 1899, ii, 224) on the polymeric thoric oxides. It was there shown that many oxides possess the power of polymerising, and the product acts as a bivalent radicle. The compounds with acids belong to the group of "complex" compounds. Metathorium oxide [the author regards thorium as bivalent and writes this $(\text{ThO})_n$] combines with acids without elimination of water, thus with hydrochloric acid $(\text{ThO})_n 2\text{HCl}$ is formed. On several points, Stevens' work is not in agreement with the author's.

J. McC.

Atomic Weight of Antimony. By G. CLAUSEN FRIEND and EDGAR F. SMITH (*J. Amer. Chem. Soc.*, 1901, 23, 502—505).—Pure potassium antimonyl tartrate was heated in a stream of hydrogen chloride and the potassium chloride thus formed freed from carbon by ignition in a current of oxygen. The residue was then extracted with water, and the solution of potassium chloride evaporated in a platinum dish. Eight determinations of the atomic weight were made, and the mean value obtained was 120.353 ($\text{O} = 16$), the maximum and minimum values differing by 0.074.

K. J. P. O.

Mineralogical Chemistry.

[Berzelianite from] the Skrickerum Mine [Sweden]. By E. SVEDMARK (*Zeit. Kryst. Min.*, 1901, 34, 693; from *Teknisk Tidskrift*, 1899).—The Skrickerum mine, in the parish of Tryserum, Government Kalmar, Sweden, is noted for the selenium minerals, eucairite, berzelianite and crookesite, which it has yielded, and it was from here that Berzelius in 1818 described the first mineral containing this element. The selenium minerals occur in a small calcite vein: the berzelianite as a dusty impregnation in the calcite, and the more rarely occurring eucairite as small, silver-white to blue-grey, malleable grains. Associated minerals are native silver and copper, cuprite, several iron silicates, carbonaceous pitchblende, uranium ochre, &c.

The amount of berzelianite impregnating the calcite varies from a trace to 10 per cent. of the whole mass, and on an average is about 3 per cent. An analysis by C. G. Särnström of the pure berzelianite gave:

Se.	Cu.	Ag.	Au.	Total.
39.22	57.21	3.51	0.0073	99.9473.

L. J. S.

Natural Cadmium Oxide. By B. NEUMANN and E. WITTICH (*Chem. Zeit.*, 1901, 25, 561—562).—A specimen of calamine from Monte Ponì, Sardinia, was covered with a dark-brown, amorphous crust, which contained some small, very lustrous crystals. These consisted of cadmium oxide, belonged to the cubic system, had a hardness about 3 and a sp. gr. 6·15. No traces of cadmium were found in the calamine.

R. H. P.

Turgite from the Uspensk Mine, South Urals. By J. SAMOILOFF (*Zeit. Kryst. Min.*, 1901, 34, 701; from *Bull. Soc. Imp. Nat. Moscou*, 1899, 1, 142—165).—An earthy iron-ore from this mine gave in four analyses the following extreme values, proving it to be turgite, $2\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$.

Fe_2O_3 .	Mn_2O_3 .	H_2O .	Sp. gr.
90·1—91·6	2·8—3·9	4·3—6·0	4·63

The amount of water expelled at 110° varied from 1·8 to 3·2 per cent. in the four samples. The presence of manganese sesquioxide suggests the existence of a hydrate, $2\text{Mn}_2\text{O}_3 \cdot \text{H}_2\text{O}$, corresponding with turgite. The several minerals associated with this iron-ore are each described.

L. J. S.

Transformation of Mirabilite into Thenardite. By S. SCHEMTCHEUSCHNY and NICOLAI KURNAKOFF (*Zeit. Kryst. Min.*, 1901, 34, 700; from *Verh. russ. min. Ges.*, 1899, 37; *Protoc.* 49—52).—It is a known fact that when sodium chloride is added to a solution of sodium sulphate there may be a separation of crystals of anhydrous sodium sulphate even at the ordinary temperature. It is shown that the same reaction takes place in salt lakes in nature, for example, in the Mormischan Lake in Tomsk, Siberia. Here, under certain conditions, depending on the season of the year and the temperature of the water, the relative amounts of salt and mirabilite ($\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$) may be such that crystals of thenardite (Na_2SO_4) are deposited.

L. J. S.

Celestite from Marienstein, Bavaria. By P. VON SUSTSCHINSKY (*Zeit. Kryst. Min.*, 1901, 34, 563—568).—A crystallographic description is given of the bluish celestite which, with crystals of calcite, lines drusy cavities in a greenish-grey marl mined for the manufacture of cement at Marienstein, near Tegern Lake. Three habits of crystals are distinguished [$a : b : c = 0·77918 : 1 : 1·2824$] $2E_{\text{Na}} = 86^\circ 50'$. Analysis gave:

SO_3 .	SrO.	BaO.	CaO.	Total.	Sp. gr.
44·73	52·21	1·16	1·58	99·68	3·99

The calcium, which was separated by the ether-alcohol method, was found by spectroscopic examination to still contain a little strontium.

L. J. S.

Solubility of Quartz in Solutions of Sodium Tetraborate. By GIORGIO SPEZIA (*Atti Accad. Sci. Torino*, 1900—1901, 36, 631—639).—On heating quartz in a closed vessel with a 5 per cent. solution of borax at a temperature of 290 — 315° , the author finds that at the end of 4 days, 0·257 gram on an original weight of 1·0678

grams of quartz was dissolved; the quartz showed deep etchings and a deposit of hydrated silica was found on the walls of the containing vessel. The solubilities of the quartz parallel and perpendicular to the axis are different. The pressure in the above experiment was 76—106 atmospheres, but at a temperature of 12—16° and a pressure of 6000 atmospheres, borax solution does not dissolve quartz. These results indicate that mineral waters containing borax at a depth in the earth's crust corresponding with the high temperature necessary for their action may be energetic solvents of quartz. It is more probable also that the borosilicates stable at the ordinary temperature, such as tourmaline, axinite and datolite, are formed at high temperatures in the wet way by the help of solutions of sodium borosilicate than by means of volatile chlorides and fluorides, as has been previously suggested.

T. H. P.

Analyses of Minerals from the Neighbourhood of Polička. By FRANTIŠEK KOVÁŘ (*Zeit. Kryst. Min.*, 1901, 34, 704; from *Rozpravy České Akad. [Memoirs Bohemian Acad.]*, 1899, 8, No. 28, 12 pp.).—I, Pleonaste from Unter-Lhota in Moravia: dark brown to black in primitive limestone. II, Kyanite from Trpín in Moravia: in limestone. III, Grammatite (tremolite) from Bistrau in Bohemia: yellowish-green with silky lustre in veins in primitive limestone. IV, Cocolite from the same limestone: leek-green grains. V, Gibbsite from Klein-Tresny in Moravia: greyish-white nodules with internal radial to platy structure.

	SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	MnO.	CaO.	MgO.	H ₂ O.	Total.	Sp. gr.
I.	0.98	62.96	8.81	3.17	—	—	24.70	—	100.25	3.81
II.	37.23	62.50	—	—	trace	0.14	—	0.19	100.06	3.50
III.	57.01	0.29	—	0.95	—	13.62	27.98	0.33	100.18	2.96
IV.	53.92	0.17	—	7.80	trace	23.13	14.66	0.14	99.82	3.26
V.	1.03	64.92	trace	—	—	0.17	trace	34.12	100.24	2.37

VI. Manganocalcite as pale rose-red spherical and botryoidal aggregates in limonite filling a crevice in limestone in a graphite mine at Gross-Tresny, Moravia.

	CaO.	MgO.	MnO.	FeO.	CO ₂ .	Insol.	Total.
VI.	42.63	2.48	8.91	1.64	42.97	1.86	100.49

VII. At the last-named locality is found a mixture of realgar and orpiment, which is at first plastic but hardens on exposure to air. The orpiment seems to have been derived from the realgar, which itself has probably been derived from the mispickel and pyrites which are abundantly present.

	As.	S.	Fe.	H ₂ O.	Insol.	Total.
VII.	58.50	32.12	trace	0.93	8.06	99.61

L. J. S.

[Analyses of Moravian Minerals.] By FRANTIŠEK KOVÁŘ (*Zeit. Kryst. Min.*, 1901, 34, 706; from *Zeit. chem. Ind. Prag*, 1899).—A compact, very soft mineral resembling pinite occurs in crevices in limestone at Unter-Lhotka, near Kunststadt, in Moravia. It has a splintery fracture, and is translucent at the edges. Analysis gave the results

under I. The mineral is similar to Laspeyres' hygrophilite, but has been derived from felspar and not from cordierite.

	SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	CaO.	MgO.	(K,Na) ₂ O.	H ₂ O.	Total.	Sp. gr.
I.	48·56	31·72	0·28	3·17	0·95	0·33	6·25	9·28	100·54	2·65
II.	83·30	0·44	7·08	—	—	0·35	trace	9·17	100·34	2·24

Ferruginous opal, occurring with hornstone in mica-schist at Rovečín, near Kunststadt, gave, on analysis, the results under II. L. J. S.

Laumontite from the Caucasus. By PETR A. ZEMJATSCHENSKY (*Zeit. Kryst. Min.*, 1901, 34, 702; from *Trav. Soc. Imp. Nat. St. Pétersbourg, Compt. rend.*, 1899, Nos. 1—2, 15—20, 30—32. Compare Abstr., 1896, ii, 369).—The following analysis is given of crystals of laumontite found in porphyrite in a railway cutting in the valley of the Bambak-tschay River, 126 kilometres from Tiflis.

SiO ₂ .	Al ₂ O ₃ .	CaO.	H ₂ O.	Total.
52·31	23·04	12·22	12·43	100·00

Heulandite from the same locality is also described. L. J. S.

Analysis of Bucklandite [Epidote]. By J. A. ANTIPOFF (*Zeit. Kryst. Min.*, 1901, 34, 699; from *Verh. russ. min. Ges.*, 1899, 37, Protoc. 45—48).—Crystals from Achmatovsk, Urals, were carefully selected for analysis, and treated with acid to dissolve calcite enclosures.

SiO ₂ .	CaO.	Al ₂ O ₃ .	Fe ₂ O ₃ .	FeO.	MgO.	CeO ₂ .
35·32	28·12	16·90	12·31	4·06	0·28	0·81
K ₂ O.	Na ₂ O.	TiO ₂ .	H ₂ O.	Total.	Sp. gr.	
0·68	0·11	trace	1·60	100·19	3·44	

L. J. S.

[Tremolite from Pisek, Bohemia.] By A. KREJČÍ (*Zeit. Kryst. Min.*, 1901, 34, 705; from *Sitz.-ber. böhm. Ges. Wiss.*, 1899, No. XLIX).—Notes are given on various minerals from the neighbourhood of Pisek. The following analysis was made by Schelle of white columnar tremolite from the primitive limestone:

SiO ₂ .	(Al,Fe) ₂ O ₃ .	CaO.	MgO.	Total.
53·17	3·02	25·07	19·31	100·57

L. J. S.

Analysis of Pyrosmalite. By FERRUCCIO ZAMBONINI (*Zeit. Kryst. Min.*, 1901, 34, 554—561).—A summary is given of the literature of this mineral. The following new analysis of material from Nordmark, Sweden, gives the formula $\text{RCl}_2, 12\text{RO}, 10\text{SiO}_2, 8\text{H}_2\text{O}$.

SiO ₂ .	FeO.	MnO.	CaO.	MgO.	Al ₂ O ₃ .	H ₂ O.	Cl.	Total.	less O for Cl.
34·71	27·76	24·30	0·43	1·11	0·26	8·31	4·16	100·10	

L. J. S.

Meteoric Iron from Alt-Bělá, Moravia. By F. SMYČKA (*Zeit. Kryst. Min.*, 1901, 34, 707; from *Jahresber. Real-gymn. Mährisch-Ostrau*, 1899).—This, the first Moravian meteoric iron, is from Alt-

Bělá, near Mährisch-Ostrau; it is said to have been found at the beginning of the 19th century, and originally weighed 3.9 kilograms. It is an octahedrite with fine lamellæ. Analysis by M. Neff and A. Stocký gave :

Fe.	Ni.	Co.	P.	S.	C.	Residue.	Total.	Sp. gr.
85.34	12.89	0.41	0.39	0.06	0.02	0.86	99.97	7.525

L. J. S.

Physiological Chemistry.

Respiration and Temperature of the Marmot. By MARCUS SEYMOUR PEMBREY (*J. Physiol.*, 1901, 27, 66—84).—In the active marmot, the discharge of water from the lungs is smaller, and greater variations occur in the respiratory quotient than in the rabbit. During hibernation, the discharge of water is still less; the respiratory quotient sinks to 0.53, so that the animal gains in weight. During the awakening, increased muscular activity (shivering) is seen, and metabolism becomes more active especially in relation to fats and carbohydrates; the temperature rises; so does the respiratory quotient. The discharge of moisture is only slightly augmented, so that the proportion of carbon dioxide to water may be as high as 16; in the active animal this number is 3. Cheyne-Stokes respiration is frequently seen when the torpidity is not profound. W. D. H.

Passage of Carbon Monoxide from Mother to Fœtus. By MAURICE NICLOUX (*Compt. rend.*, 1901, 133, 67—69).—Observations on animals show that the amount of carbon monoxide in fœtal and maternal blood is equal when the air breathed by the mother contains small quantities of the gas. When the percentage of the gas in the air is raised so that it is fatal, the amount in the fœtal is much less than in the maternal blood. Dissociation of the carboxyhæmoglobin is believed to occur in the placenta. W. D. H.

Sugar Formation and Enzymic Action in Liver Cells. By MANFRED BIAL (*Chem. Centr.*, 1901, ii, 315; from *Arch. Anat. Physiol.*, 1901, 249—255).—The formation of sugar in the living and 'surviving' liver is attributed to its production from glycogen by the diastatic ferment of the lymph. W. D. H.

Iron in the Hen's Egg. By PAUL HOFFMANN (*Zeit. anal. Chem.*, 1901, 40, 450—459).—An average of ten estimations showed that 100 grams of egg-yolk contain 12 milligrams of iron oxide, or 1 egg without shell 1.8 milligrams. By feeding the hens on hæmogallol or ferro-hæmol, the liver contains more iron, so also do the eggs; the hæmogallol comparatively poor in iron acts best, the amount rising by a few milligrams. By feeding with copper preparations (cuprohæmol), no copper goes into the egg. W. D. H.

Nutritive Value of Flesh. By JOHANNES FRENTZEL and MAX SCHREUER (*Chem. Centr.*, 1901, ii, 316—317; from *Arch. Anat. Physiol.*, 1901, 284—298).—For five days the nitrogen and calorific value of food, urine and faeces were estimated in a dog on pure flesh diet. 74·8 per cent. of the available energy was utilised.

W. D. H.

Metabolic Studies in Man. By A. LOEWY and FRANZ MÜLLER (*Chem. Centr.*, 1901, ii, 315; from *Arch. Anat. Physiol.*, 1901, 299—322).—The metabolic processes were studied on the authors' persons during rest and work. The absorption of nitrogenous material is much better during activity. Muscular work increases in muscle the process of assimilation, and with regard to non-nitrogenous material that of katabolism also. A good deal of nitrogen leaves the body by the sweat. Somatose was not found to be well utilised; it remains for days unabsorbed in the intestine.

W. D. H.

Value of Proteid in Nutrition. By H. LICHTENFELT (*Pflüger's Archiv*, 1901, 86, 185—193).—Metabolic studies show that the proportion between the intake and output of proteid is the same whether vegetable proteid or vegetable proteid mixed with animal proteid is given in the food.

W. D. H.

Nutrition during Training. By H. LICHTENFELT (*Pflüger's Archiv*, 1901, 86, 177—184).—Study of the diet and metabolic exchanges in athletes during training (mainly derived from Atwater's American statistics) supports the doctrine advanced by Pflüger that proteid decomposition is the main source of muscular energy.

W. D. H.

Feeding on Small Amounts of Proteid. By WILHELM CASPARI (*Chem. Centr.*, 1901, ii, 314—315; from *Arch. Anat. Physiol.*, 1901, 323—337).—These experiments on metabolism were undertaken on the author's own person; he remained in nitrogenous equilibrium while the daily supply of nitrogen was 13·3 grams, but this failed when the supply was lowered to 10 grams. Lower limits had been reached by others; the limit evidently varies in different people.

W. D. H.

Metabolism in Dogs with shortened Small Intestine. By JOSEPH ERLANGER and ALBION WALTER HEWLETT (*Amer. J. Physiol.*, 1901, 6, 1—30).—Dogs with a large amount of the small intestines removed behave much like normal dogs, so long as the diet is easily absorbable and contains only a small amount of fat. Errors in diet easily set up diarrhoea, which may prove fatal. The only noteworthy change in the urine is an increase of ethereal sulphates, indicating an excess of intestinal putrefaction.

W. D. H.

Gaseous Metabolism of the Submaxillary Gland. By JOSEPH BARCROFT (*J. Physiol.*, 1901, 27, 31—47. Compare this vol., ii, 28).—During the secretion of saliva induced by stimulation of the chorda tympani nerve, the oxygen taken from the blood by the submaxillary gland is three or four times greater than that taken by the resting organ. The carbon dioxide produced is increased to an equal or even greater

extent. After the secretory activity is stopped by atropine, the oxygen used up during stimulation of the nerve is not increased, but the output of carbon dioxide is for a time.

W. D. H.

Glycogen Formation after Proteid Feeding. By FERDINAND BLUMENTHAL and J. WOHLGEMUTH (*Chem. Centr.*, 1901, ii, 315—316; from *Berlin klin. Woch.*, 38, 391—394).—In frogs, gelatin produces no liver glycogen. Egg-white, on the other hand, containing as it does a carbohydrate radicle, leads to glycogen formation. The fact that a proteid yields leucine has no influence on the question, for both gelatin and casein yield leucine.

W. D. H.

Influence of Lecithin on Nutritive Exchanges. By G. CARRIÈRE (*Compt. rend.*, 1901, 133, 314—316).—Lecithin administered to children is stated to produce a favourable effect on their growth, and on the elements of the blood. The urea in the urine increases at first, and the phosphoric acid diminishes, but after a few months both become normal.

W. D. H.

Absorption in the Intestine. By RUDOLF HÖBER (*Pflüger's Archiv*, 1901, 86, 199—214).—A series of renewed experiments is recorded which support the conclusion that certain pigments are absorbed by the epithelial cells, but that salts, most carbohydrates, and all substances for which living protoplasm is not permeable are absorbed between the cells (compare Abstr., 1899, ii, 372).

W. D. H.

The Sugars of the Blood. By RAPHAEL LÉPINE and BOULUD (*Compt. rend.*, 1901, 133, 138—139).—In dogs fed on meat, the blood gave evidence of the presence of other sugars (pentoses, lævulose, maltose, &c.) than dextrose. These are stated to be readily transformable one into the other in the blood.

W. D. H.

Excretion of Oxygen Compounds of Phosphorus. By G. GAMEL (*Chem. Centr.*, 1901, ii, 315; from *Schweiz. Woch. Pharm.*, 39, 302—303).—Insoluble metaphosphates and guaiacol phosphate pass unchanged through the alimentary canal; hypophosphites pass wholly as such into the urine, phosphites partly as such and partly as phosphates. Soluble metaphosphates, pyrophosphates, and orthophosphates are partly found in the faeces and partly as alkali phosphates in the urine. The phosphorus of guaiacol phosphite appears wholly as phosphite in the urine.

W. D. H.

Formation of Allantoin from Uric Acid in the Body. By ROBERT E. SWAIN (*Amer. J. Physiol.*, 1901, 6, 38—47).—In dogs, allantoin is excreted in the urine after ingestion of uric acid. Considerable quantities of uric acid, however, are burnt up beyond the allantoin stage. The uric acid itself is only slightly increased.

W. D. H.

Acidity of some Animal Excretions. By MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1901, 133, 192—199).—The acidity of the gastric juice under normal conditions is the same whatever indicator is used, and hence must be attributed to hydrochloric acid, but under

abnormal conditions it varies with the indicator. The saliva behaves as if it contained alkali salts of very weak acids. The acidity of urine varies widely with the indicator, and also at different times with the same indicator, according to the conditions under which it was collected.

C. H. B.

Actions of Currents of High Frequency and High Tension on Urinary Excretion. By DENOYÉS, MARTRE, and ROUVIÈRE (*Compt. rend.*, 1901, 133, 180—182. Compare this vol., ii, 564).—The quantity of toxic material excreted in the urine is increased by the action of the current and the effect lasts some time after the treatment.

W. D. H.

Acid Poisoning in Birds. By T. H. MILROY (*Proc. Physiol. Soc.*, 1901, xii—xiv).—By making an artificial anus in birds, the urine and fæces could be collected separately; 0·5 gram per kilo. of body weight of hydrochloric acid was then given, a watery urine was passed containing scattered white flakes; the uric acid sank to about a tenth of the normal, whilst there was a great increase in the ammonia. After discontinuing the acid, normal conditions were slowly re-established. The excretion of purine bases, normally small in birds, was only slightly affected. Lactic acid produced an even more marked effect of the same kind; symptoms of acid poisoning were also more evident. If the lactic acid is neutralised with ammonia, the uric acid rose above the normal; the excretion of ammonia is also high. Nucleic acid given to birds increases the uric acid.

W. D. H.

Anæmia during Gestation. By ALBERT CHARRIN and A. GUILLEMONAT (*Compt. rend.*, 1901, 133, 182—185).—The anæmia of pregnancy does not affect the corpuscular elements so much as the materials in solution in the blood; among a number of points noticed are an oscillation in the alkalinity of the blood, and an increased rapidity of coagulation (*in vitro*).

W. D. H.

The Affinity of Red Blood Corpuscles for Acids and Alkalis and the Resistance so produced towards Solanine. By E. HÉDON (*Compt. rend.*, 1901, 133, 309—312).—After the red corpuscles are completely freed from serum by the centrifuge, they possess the power of fixing in their substance both acids and alkalis. This, up to a certain limit, occurs without destruction of the corpuscles or liberation of their hæmoglobin. Corpuscles so treated with acid are very resistant towards solanine, a very powerful hæmolyzing agent. On the other hand, alkalis favour the hæmolysis by solanine.

W. D. H.

Experimental Parthenogenesis. By YVES DELAGE (*Compt. rend.*, 1901, 133, 346—349).—Experiments on the maturation of echinoderm eggs, showing how partial development may be induced experimentally without fecundation. Special stress is laid on the maturation of the cytoplasm, rather than of the nucleus.

W. D. H.

Impermeability of Skin and External Mucous Membranes to Hydrogen Sulphide. By AUGUSTE CHAUVEAU and TISSOT (*Compt. rend.*, 1901, 133, 137—138).—Animals live quite well in a lethal

atmosphere containing hydrogen sulphide, provided that they are allowed to inhale pure air through a tube.

W. D. H.

Physiology of the Suprarenal Capsules. By HANS STREHL and OTTO WEISS (*Pflüger's Archiv*, 1901, 86, 107—121).—Complete extirpation of both suprarenal capsules in large numbers of animals (mammals and frogs) is invariably fatal in from 8 to 138 hours. If one only is excised, the other hypertrophies; on removal of the second, death ensues. The most prominent symptom before death is muscular weakness. The blood of the suprarenal vein contains the substance which elevates blood pressure. If one capsule is extirpated, and the remaining suprarenal vein is compressed, the arterial pressure falls, and on releasing the vein the pressure rises to a height greater than the normal. Nothing new is added to the chemistry of the active substance; no spermine was found. No other organ yields a substance which raises blood-pressure.

W. D. H.

Action of Pituitary Extract on the Kidney. By R. MAGNUS and EDWARD ALBERT SCHÄFER (*Proc. Physiol. Soc.*, 1901, ix—x).—Although the main effect of pituitary extract is to cause contraction of organs, it produces expansion of the kidney and diuresis, so differing from suprarenal extracts. The material which is active in this direction is soluble in water, but not in alcohol; it is derived from the nervous or infundibular portion of the pituitary body.

W. D. H.

Pharmacology of Pyraconitine and Methylbenzaconine considered in relation to their Chemical Constitution. By J. THEODORE CASH AND WYNDHAM R. DUNSTAN (*Proc. Roy. Soc.*, 1901, 68, 384—389. Compare *Abstr.*, 1899, ii, 42—43).—A detailed account is given of the physiological action of these two alkaloids. It is found that in the case of pyraconitine (*Trans.*, 1894, 65, 176), as in that of benzaconine, the great toxicity of aconitine is almost entirely abolished by the withdrawal of the acetyl group. Of the two alkaloids, benzaconine and pyraconitine, the latter is the more active, and although there is a similarity in the physiological effects which they produce, the differences are more considerable than they would be if pyraconitine were merely the anhydride of benzaconine.

The substitution in aconitine of methyl for acetyl which occurs in the formation of methylbenzaconine (*Proc.*, 1896, 12, 159) has led to a very considerable reduction of toxicity, and has introduced a curare-like effect. Methylbenzaconine is more powerful than benzaconine owing to the presence of the methyl group.

The chief action of pyraconitine on the heart is to cause slowing, partly from vagus irritation, partly from depression in function of intrinsic rhythmic and motor mechanisms. Activity of respiration is reduced (by central depression) to a degree incompatible with life, as is the case after aconitine and benzaconine. The spinal cord is impaired in its reflex function, apparently secondarily to reduced circulation in its structure. Neither muscular nor intramuscular nervous tissue is strongly influenced by large doses of the alkaloid.

The effects of pyraconitine are contrasted with those of benzaconine. The former alkaloid is about six times more toxic than the latter.

Methylbenzaconine in large doses causes slowing of the heart; the cardiac vagus is depressed in action, and its inhibitory function is ultimately suspended. Motor nerves are greatly affected, the action being curare-like in character.

The effects of methylbenzaconine are contrasted with those of aconitine and benzaconine. The toxicity of aconitine is 80 to 100 times that of methylbenzaconine, whilst the latter is about three times more toxic than benzaconine. E. G.

Pharmacology of Pseudaconitine and Japaconitine considered in relation to that of Aconitine. By J. THEODORE CASH and WYNDHAM R. DUNSTAN (*Proc. Roy. Soc.*, 1901, 68, 378—384. Compare Abstr., 1899, ii, 42—43).—The differences observed in the action of these three alkaloids are nearly always differences of degree and not of kind. They all have a similar effect upon the heart. Vagus stimulation causes slowing of the heart in each case. Pseudaconitine produces less tendency to acceleration of respiration than the other two alkaloids, whilst the dyspnoeal conditions develop more suddenly and the central depression of respiration is greater. Japaconitine is at first slightly more depressant than aconitine, but thereafter the tendency to acceleration of respiration is sooner developed. All the aconitines produce a deleterious effect on the hæmoglobin and coloured blood corpuscles. The effect on the brain and cord is the same in each case. The initial elevation of temperature produced by aconitine or japaconitine is less frequently observed with pseudaconitine, whilst a slightly greater and more enduring fall of internal temperature is witnessed after a large dose of the latter. Some tolerance is established on the part of rabbits towards all the aconitines, but less towards pseudaconitine than towards the other two. The effect of local application upon the sensory nerves is somewhat more powerfully depressant and enduring with aconitine or japaconitine than with pseudaconitine, but the difference is only slight. It is more difficult to reduce reaction or to produce insensitiveness of the intramuscular motor nerves by pseudaconitine than by the other alkaloids. Direct contact of the alkaloidal solutions with muscle-nerve preparations reduces excitability; pseudaconitine produces a rather weaker effect than the other two, of which japaconitine is slightly the more energetic. The general order of toxicity towards mammals is pseudaconitine, japaconitine, and aconitine, which is the least toxic. Pseudaconitine has been found to be about twice as toxic as aconitine towards small mammals and birds, whilst the relative toxicity of japaconitine to aconitine is approximately as ten to nine. E. G.

A Method of obtaining Intracellular Juices. By SYDNEY ROWLAND (*J. Physiol.*, 1901, 27, 53—56).—An apparatus consisting mainly of a disintegrator and a powerful press for breaking up tissues and expressing their juice is described and figured. W. D. H.

[Proximate Composition of] Nervous Tissue. By N. ALBERTO BARBIERI (*Compt. rend.*, 1901, 133, 344—346).—The portion of the brain tissue of an ox soluble in ether consists principally of fats which yield cholesterol on hydrolysis, and nucleins which furnish cerebrin.

The portion soluble in water containing ether yields two globulins (α - and β -), an alkali globulin (?), a ptomaine hydrochloride, an aromatic substance, a substance intermediate between leucine and butalanine, and volatile fatty acids. The portion insoluble in both ether and water yields cerebrin, homocerebrin, keratin, and a proteose (?), along with a non-nitrogenous substance soluble in chloroform and melting at 135° , and a substance crystallising from acetone in white needles melting at 138° (erythrocholesterol?). W. A. D.

Benzoylation of Alcapton Urine. By KENNEDY J. P. ORTON and ARCHIBALD E. GARROD (*J. Physiol.*, 1901, 27, 89—94).—On the addition of benzoyl chloride and sodium hydroxide to alcapton urine, a product is formed which is at once thrown down when a hot alcoholic extract of the precipitate is poured into water. This crystallises in colourless needles which melt at 204° . It may also be prepared in a similar way from a solution of homogentisic acid in the presence of ammonia. The product in question is the amide of dibenzoylhomogentisic acid; this acid may be liberated by treatment with fuming nitric acid, and on again treating it with benzoyl chloride and sodium hydroxide in the presence of ammonia, the amide is obtained. These facts furnish an additional means of detecting homogentisic acid in the urine. W. D. H.

Combination of Glycuronic Acid with Fatty Compounds. By OTTO NEUBAUER (*Chem. Centr.*, 1901, ii, 314; from *Arch. exp. Path. Pharm.*, 46, 133—154).—The physiological action of various fatty compounds on rabbits in reference to the formation of glycuronic acid compounds has been further investigated (compare Thierfelder and Mering, *Abstr.*, 1885, 1002). The secondary fatty alcohols, and to a very much less extent the primary, with the exception of methyl alcohol and alcohols of high molecular weight, form glycuronic acid compounds. Some polyhydric alcohols, such as propylene glycol, form compounds of this type, whilst others, such as glycerol, do not. All aliphatic ketones, as well as acetophenone, partially combine with glycuronic acid, but only after being reduced to secondary alcohols, as is shown by the fact that when the glycuronic compounds are decomposed by boiling the urine with dilute sulphuric acid, the distillate does not give the ketonic reaction until it has been oxidised by potassium dichromate and sulphuric acid. Experiments with aldehydes gave doubtful results. The hydrocyclic compounds, *l*-menthone and menthene, form glycuronic acid compounds. Since normal urine contains only very small quantities of glycuronic acid compounds, and these include aromatic components, the alcohols and ketones cannot be regarded as intermediate products of processes taking place in the organism. E. W. W.

Relationships between Physiological Action, Chemical Constitution, and Chemical Change in the Organism. By HERMANN HILDEBRANDT (*Chem. Centr.*, 1901, ii, 316; from *Arch. internat. Pharmacodynamie Thérap.*, 8, 499—509. Compare *Abstr.*, 1900, ii, 676).—When thymotinipiperidine is administered to rabbits, about half is excreted as a glycuronic acid compound, whilst the remainder is probably oxidised in the organism, but the proportion so oxidised is

not affected by keeping the rabbits in an atmosphere of oxygen. Piperidine itself, however, which is less poisonous than the piperide, and is more completely oxidised in the organism, is to a certain extent rendered less poisonous by respiration of oxygen. On comparing the behaviour of diethylamine and pyrrolidine, it has been found that, unlike that of citral and *cyclocitral* (this vol., ii, 180), the chain compound is less poisonous, and probably more easily oxidised than the ring compound. The pharmacological actions of the benzoate and mandelate of Pauly's 3-hydroxy-2:2:5:5-tetramethylpyrrolidine, $\text{CMe}_2 \begin{array}{c} \text{CH}_2 \cdot \text{CH}(\text{OH}) \\ \text{---} \text{NH} \end{array} \text{CMe}_2$, are very similar to those of the corresponding piperidine derivatives, "eucaine B" and "euphthalmine," but whilst the benzoate of the pyrrolidine derivative has a similar anæsthetic action to that of "eucaine B," it is less poisonous, and the mandelate has a weaker mydriatic effect than "euphthalmine."

E. W. W.

Decomposition of Cocaine and Atropine in the Animal Organism. By WILHELM WIECHOWSKI (*Chem. Centr.*, 1901, ii, 317; from *Arch. exp. Path. Pharm.*, 46, 155—162).—After administering cocaine to dogs, 0—12 per cent. was found unchanged in the urine, whilst after similar treatment with atropine, 17—57 per cent. of the alkaloid was excreted. When cocaine is given to rabbits, however, none of the alkaloid is found in the urine. Since ecgonine and tropine, the characteristic decomposition products of cocaine and atropine, respectively, could not be detected in the urine, both alkaloids must undergo a very thorough decomposition in the organism.

E. W. W.

Chemistry of Vegetable Physiology and Agriculture.

Reaction of Bacteria to Chemical Stimuli. By HERBERT S. JENNINGS and J. H. CROSBY (*Amer. J. Physiol.*, 1901, 6, 31—37).—A new series of experiments which show that the so-called tactic phenomena exhibited by bacteria are due to a definite movement or reflex action produced by the stimulating agent. In this respect, chemical stimuli act like other irritants.

W. D. H.

Oxydase in Yeast. By J. GRÜSS (*Chem. Centr.*, 1901, ii, 364, 364—365, and 436; from *Woch. Brauerei*, 18, 310—312, 318—321, and 335—338. Compare Effront and Tolomei, *Atti R. Accad. Lincei*, [v], 5, 52).—As a carrier of oxygen, the oxydase of yeast resembles the oxydase obtained by the author from barley (this vol., ii, 33); it oxidises tetramethyl-*p*-phenylenediamine chloride, but not guaiacol. Pressed bottom fermentation yeast generally acts on "tetra" paper, but not when the paper is saturated with soda; with pressed top fermentation yeast, the effect is reversed. Glycerol extracts of top fermentation yeast

reduce ammoniacal silver solution, but not Fehling's solution. In the case of extracts of bottom fermentation yeast, the action on silver solutions is very slight. The reducing substance is distinguished from the oxydase by the fact that the latter cannot be extracted by glycerol. The results indicate that the effect of the oxydase on salts of tetramethylene-*p*-phenylenediamine may be masked by the reducing substance present in yeast. The reducing substance, which is produced during fermentation, is gradually destroyed by contact with air.

The oxydase is weakened by a low temperature ($0-3^{\circ}$), and by 96 per cent. alcohol, and is destroyed by heating at $60-65^{\circ}$. It is also weakened when the yeast with which it is associated is kept in pure water, whilst its power is maintained when the yeast is kept in a solution of asparagine. It is suggested that the oxydase converts asparagine into malic acid, with liberation of nitrogen and water: possibly the succinic acid found in fermenting solutions is due to the further action of the oxydase on malic acid.

Yeast oxydase seems to effect the oxidation of phenylhydrazine. Magenta and methylene-blue, decolorised by sulphur dioxide, have their colours more quickly restored in presence of yeast than without yeast.

Catalysing substances occur in nature which have no effect on guaiacol, but bring about the oxidation of di- and tetra-methyl-*p*-phenylenediamine. It is doubtful, at present, whether laccase, which acts on guaiacol, has this property. The periderm of potato tubers contains an oxydase which differs both from the spermase of barley (*loc. cit.*), and from the yeast oxydase.

It is proposed to divide the oxydases into two groups, guaiacol-oxydases and amino-oxydases.

N. H. J. M.

Buchner's Yeast Extract. By AUGUSTIN WRÓBLEWSKI (*J. pr. Chem.*, 1901, [ii], 64, 1-70).—The extract obtained by the author (this vol., ii, 465) is a somewhat viscous liquid, of aromatic odour and sweet taste, and exhibits a brownish-yellow or greyish-blue fluorescence. It is either optically inactive or feebly dextrorotatory. Filtration through a Berkefeld or sandstone filter diminishes, and through a Chamberland filter entirely removes, the fermenting power. The extract does not act on starch granules, but ferments starch paste, soluble starch, glycogen, or sucrose.

In fermentation by yeast cells, the zymase remains in the cells and does not diffuse into the sugar solution. If the cells are collected on a sandstone filter, fermentation in the sugar solution ceases. The author expresses the opinion that the sugar solution passes into the cells and is there fermented. Alcohol and carbon dioxide, accordingly, are true excreta of the yeast cells.

0.5 per cent. of neutral salts increases the fermenting action on sucrose, 1 per cent. decreases, and 2.5 per cent. completely destroys, the activity of the yeast. 0.05 per cent. of hydrochloric or acetic acid lessens the activity. Fermentation is increased by addition of 0.02 to 0.03 per cent. of sodium hydroxide, decreased by 0.1 per cent., and prevented by 0.2 per cent., when the phosphates are precipitated. Phosphates have a favourable action (compare this vol., ii, 328).

Dilution at first renders the zymase less active, and finally inactive. When the extract is diluted with a solution of phosphates, the effect is not so great. Formaldehyde inhibits fermentation when added to the amount of 0.05 per cent. 0.007 per cent. of sodium nitrite stimulates the activity of the yeast cells, but 0.035 per cent. depresses it, whilst with 0.25 per cent. nitrogen is evolved (compare Abstr., 1900, ii, 157). Nitrous acid (that is, a mixture of sodium nitrite and hydrochloric acid) has a far greater inhibiting effect than either sodium nitrite or hydrochloric acid alone. After addition of 10 per cent. of alcohol, the activity decreases, and ceases after addition of 15 per cent., whilst 20 per cent. produces a voluminous precipitate of proteids. Glycerol has little action at concentrations below 25 per cent.

The author believes that the zymase is not an enzyme, but a colloidal substance which exists in the extract in a state of semi-solution, and belongs to the group of protoplasmic ferments (compare Abstr., 1900, ii, 158).

Invertin, unlike zymase, diffuses out of the yeast cells, and cannot be filtered off (compare Abstr., 1900, ii, 158, and this vol., ii, 465). It is most active when within the cell. When prepared from yeast extract (*loc. cit.*), it is always very impure and accompanied by a carbohydrate, mannosan (compare Salkowski, this vol., i, 180), which, after warming with hydrochloric acid, reduces Fehling's solution, is precipitated by lead acetate and ammonium sulphate, does not give a reaction with iodine, and produces only a brown coloration with hydrochloric acid and phloroglucinol.

The inverting action of invertin is depressed by 0.14 per cent. of hydrochloric acid, by 0.1 per cent. of sodium hydroxide, by dilution with water, or by addition of alcohol, of large quantities of neutral salts, or of small quantities of alkaline phosphates; on the other hand, addition of acid phosphates is advantageous. Invertin is not decomposed by the proteolytic enzyme of the extract or by trypsin. In comparison with diastase, it is more readily soluble, and less easily precipitated.

In addition to substances and ferments previously found in yeast extract (Abstr., 1899, ii, 170), the presence of enzymes capable of acting on maltose, glycogen, starch, and cellulose, and of coagulating nucleoalbumin, has been demonstrated. Besides the phosphates of the alkaline earths, the extract contains phosphoric acid in combination with an organic substance. This compound crystallises in small leaflets, and neither gives a peptone reaction nor reduces Fehling's solution. Glycerol, lecithin, xanthine-like substances, and formic acid are present in the extract. The ethereal extract contains fats, cholesterol, and a substance crystallising in needles. K. J. P. O.

Nitrogenous Nutrition of Yeast. By PIERRE THOMAS (*Compt. rend.*, 1901, 133, 312–314).—Ten per cent. dextrose solutions fermented slowly when supplied with nitrogen in the form of urea, and the yeast formed under these conditions is poor in nitrogen; 20 per cent. solutions fermented very rapidly and produced more highly nitrogenous yeast.

When the amount of urea is increased, the amounts of yeast formed and of nitrogen assimilated tend towards a maximum, beyond which increased amounts of urea have no effect. This seems to depend on the amount of yeast, and on the nature of the nitrogenous food (Compare Stern, Trans., 1901, 79, 943).

When ammonium hydrogen carbonate is employed instead of urea, 20 per cent. dextrose solutions are still found to give the best results. As in the case of urea, the amounts of yeast formed, and of nitrogen assimilated, are increased up to a certain point by increasing the amounts of ammonium salt; the maximum is much higher than with urea. The results, which are opposed to those obtained by Hayduck, show that the composition of yeast, as regards nitrogen, is very variable.

Yeast does not assimilate acetamide to any extent when no other nitrogenous compound is present. Assimilation took place, however, in presence of ammonium acetate.

N. H. J. M.

Production of Alcohol during the Intramolecular Respiration of Seeds in Water. By EMIL GODLEWSKI AND F. POLZENIUSZ (*Bull. Acad. Sci. Cracow*, 1901, 227—276).—A more detailed account of experiments already described (compare Abstr., 1898, ii, 400). Peas introduced into a solution of potassium nitrate appear to partially reduce the nitrate, and the products of reduction kill the seeds within the course of a few days.

It is found that free oxygen is not necessary for the formation of enzymes such as diastase and invertase in plants.

The intramolecular respiration of seeds in water free from oxygen proceeds for several weeks; it begins slowly, then attains a maximum at the end of 3 or 4 days, and after one or two weeks, or even longer, gradually diminishes. The respiration is accelerated by an increase in temperature, but does not last so long. Different varieties of seeds are capable of intramolecular respiration to varying extents. The property is most marked in the case of leguminous plants, less with cereals, and least with oleaginous, seeds. It is probable that, in all cases in which the respiration occurs at the expense of carbohydrates such as dextrose, the chemical action is practically identical with ordinary alcoholic fermentation. In other cases, where the respiration occurs at the expense of carbon compounds other than hydrolysable sugars, the action is very feeble and has not been closely investigated.

It is probable that ordinary and intramolecular respiration in plants are identical in their chemical nature when the former occurs at the expense of hydrolysable carbohydrates, but that they are quite distinct when the ordinary respiration is brought about by the oxidation of other carbon compounds.

J. J. S.

Occurrence of Sucrose in the Fruit of Paris Quadrifolia. By NICOLAI KROMER (*Arch. Pharm.*, 1901, 239, 393—395).—From the dried and powdered fruit of *Paris quadrifolia*, which had been freed from fat, alcohol extracts a sugar which proved to be sucrose.

K. J. P. O.

Composition of the Albumen of the Seeds of Phoenix Canariensis and the Chemical Changes accompanying their Germination. By ÉMILE BOURQUELOT and HENRI HÉRISSEY (*Compt. rend.*, 1901, 133, 302—304).—Mannose is the chief product of hydrolysis of the crushed seed with dilute sulphuric acid. During the germination of the seed, a soluble enzyme is produced which is capable of hydrolysing the mannans of the albumen to mannose, and this sugar is utilised as rapidly as it is formed. J. J. S.

Mechanism of Esterification in Plants. By EUGÈNE CHARABOT and A. HÉBERT (*Compt. rend.*, 1901, 133, 390—391. Compare Abstr., 1898, i, 595; 1900, i, 241, 303; ii, 101, 361, 362; and this vol., i, 38).—The conclusion that etherification in plants is caused by the direct interaction of acids with alcohols, and is promoted by a special dehydrating agent, is drawn from previous results, and the following observations. (1) The esterification of linalool by acetic acid alone is much slower than that occurring in the plant; (2) the terpenic alcohols which esterify most readily with a given acid are those which are combined in the greatest proportion with this acid in plants; (3) for the same terpenic alcohol, the acid which is most readily esterified is that whose ester is most abundant in the plant; (4) when two alcohols present in a plant are esterified with the same acid, the acid is shared between them as in the plant. It is probable that the dehydrating agent is a diastase acting in a chlorophyll medium. W. A. D.

Formation of Proteids in Plants. By W. ZALESKI (*Chem. Centr.*, 1901, ii, 362; from *Ber. deut. bot. Ges.*, 19, 331—339).—The results of previous experiments with *Allium Cepa*, showing a slight increase of proteid nitrogen in relation to total nitrogen, are confirmed by experiments with onions, which show a much greater increase of proteid nitrogen. The bulbs, cut into four pieces, were placed in moist air under a bell-jar, and kept in darkness for some days. No increase of proteids takes place in an atmosphere of nitrogen.

Similar results were obtained with other roots and tubers (such as *Beta vulgaris*, *Daucus Carota*, *Petroselinum sativum*, *Apium graveolens*, *Solanum tuberosum*, and *Dahlia variabilis*) which contain considerable amounts of non-proteids and non-nitrogenous reserve substances.

N. H. J. M.

Nitrogenous Constituents of Green Leaves. By E. WINTERSTEIN (*Chem. Centr.*, 1901, ii, 360—361; from *Ber. deut. bot. Ges.*, 19, 326—330).—The leaves, extracted with boiling water, were treated successively with water rendered slightly alkaline and with 1 per cent. aqueous sodium hydroxide. The extracts precipitated with acetic acid yielded only small quantities of substance as compared with the total proteids. The residues obtained from spinach and lupins, when heated with 30 per cent. hydrochloric acid, yielded abundant precipitates with phosphotungstic acid, from which light yellow residues of the proteids were liberated by baryta. Similar results were obtained with fungi, and the author supposes that the proteids are present in combination with other groups, probably carbohydrates.

N. H. J. M.

Free Humic Acids in Mineral Soil and their Importance in Agriculture. By HEINRICH IMMENDORFF (*Bied. Centr.*, 1901, 30, 506—508; from *Mitt. Ver. Förd. Moorkult.*, 1900, 18, 13).—Four samples of sandy soil, to some of which moor soil had been applied for centuries, were found to contain 0.085 to 0.121 per cent. of free acid (reckoned as carbon dioxide), and lost on ignition 5.16 to 7.60 per cent. in the dry soil. These results indicate that the organic matter contains 1.55 to 1.84 per cent. of free acid, and closely resembles, in this respect, the humous soil originally applied. Calculating the amount of free acid per hectare to a depth of 20 cm., it is shown that the soil contains at least 2500 kilos., which would require more than 3000 kilos. of pure calcium oxide to neutralise it.

Field experiments, in which rye and potatoes were grown on peaty soil containing 0.18 per cent. of free acid, manured with Algerian phosphate, gave very satisfactory results.

The discordant results obtained by Wagner and Märcker with bone meal are perhaps due to the fact that the soils which yielded satisfactory results with bone meal contained free humic acid.

N. H. J. M.

Experiments with Different Nitrogenous Manures (Ammonia and Sodium Nitrate). By BERNHARD SCHULZE (*Bied. Centr.*, 1901, 30, 530—531; from *Jahresber. agrik.-chem. Versuchsstat. Landw.-kammer Schlesien*, 1899, 22).—Oats were grown in pots manured with 1, 2, and 3 grams of nitrogen respectively, in addition to mineral manures. The nitrogenous manures were sodium nitrate, ammonium sulphate (with and without addition of lime), and powdered bone gelatin. The effect of the three manures was almost exactly the same when 1 gram of nitrogen was applied. Larger amounts as nitrate increased the production of straw, whilst larger amounts as ammonium sulphate acted irregularly and decreased the yield of grain; bone gelatin, in quantities containing more than 1 gram of nitrogen, was injurious, owing to the rapid production of ammonium carbonate.

N. H. J. M.

Cultivated Plants and Organic Nitrogen Compounds. By ARVID THOMSON (*Bied. Centr.*, 1901, 30, 539—542; from *Sitzungsber. Naturforsch.-Ges. Univ. Jürjew (Dorpat)*, 1899, 307—322).—The results of water-culture experiments in which oats and barley were manured with urea, sodium urate, and sodium hippurate respectively, in addition to the usual minerals, showed that the growth was normal when nitrogen was present in the form of urea or uric acid. In the case of urea, the growth was nearly equal to that obtained with nitrate. Sodium hippurate proved to be unsuitable as a source of nitrogen for oats and barley.

N. H. J. M.

Manure Experiments with Crude Phosphate. By FRANZ W. DAFERT (*Chem. Centr.*, 1900, ii, 223; from *Zeit. Landw. Versuchs-Wes. Oesterr.*, 4, 627—629).—Algerian phosphate increased the yield of clover very considerably, and it is hoped that the action of the manure will extend beyond the first year.

N. H. J. M.

Influence of Potassium Salts on the Development of Barley. By JULIUS STOKLASA and J. PITRA (*Chem. Centr.*, 1901, ii, 223; from *Zeit. Landw. Versuchs-Wes. Oesterr.*, 4, 567—582).—The results of pot experiments showed that the application of a moderate amount of potassium chloride, in conjunction with superphosphate and sodium nitrate, was favourable both as regards the yield and the quality of the barley. The larger grain was unusually rich in starch, and contained relatively small amounts of proteids, spelt, and pentoses.

The same combination of manures was found to be very suitable for the production of brewing barley. N. H. J. M.

Free Iodine in Sodium Nitrate. By FRANZ W. DAFERT and AD. HALLA (*Chem. Centr.*, 1901, ii, 368—369; from *Zeit. Landw. Versuchs-Wes. Oesterr.*, 4, 732—734).—A sample of sodium nitrate was found to contain free iodine and potassium iodate (0·4 per cent.), but no iodide. The presence of free iodine is attributed to the action of organic matter (in this case, barley grains) on the iodate. N. H. J. M.

Plot and Pot Experiments with different Potassium Salts. By BERNHARD SCHULZE (*Bied. Centr.*, 1901, 30, 531—534; from *Jahresber. agrik.-chem. Versuchsstat. Landw.-kammer Schlesien*, 1899, 25).—Potassium chloride (40 per cent.) and kainite both increased the yield of sugar beet and the yield of sugar, whilst potassium sulphate had no effect. All three manures, when applied to potatoes diminished the yield of starch.

The results of the author's experiments indicate that potassium chloride and kainite do not differ essentially in their action as manures, but that potassium chloride is more completely utilised than kainite.

N. H. J. M.

Experiments with Excrement. By KRENZ and MAX GERLACH (*Bied. Centr.*, 1901, 30, 519—522; from *Jahresber. landw. Versuchsstat. Jersitz, Posen*, 1898—1899, 20).—Concentrated excrement was found to vary very considerably in composition, especially as regards nitrogen. When kept in pits, there is a great loss of nitrogen, mainly in the form of ammonia. It is therefore important that the manure should be applied to the soil as soon as possible, or else mixed with soil or peat. Human excrement is free from substances which promote the activity of denitrifying organisms. N. H. J. M.

Analytical Chemistry.

Gas Analysis Apparatus. By A. SAMOILOFF and A. JUDIN (*Chem. Centr.*, 1901, ii, 229—231; from *Arch. Anat. Phys., Physiol. Abt.*, 1901, 338—352).—A modification of the apparatus described by Schaternikoff and Setschenoff (*Abstr.*, 1896, ii, 332); also a description of a new form of a gas pipette which cannot be well understood without the accompanying illustrations.

L. DE K.

Apparatus and Procedure for Exact Incineration. By HEINRICH WISLICENUS (*Zeit. anal. Chem.*, 1901, 40, 441—449).—For completely burning the organic part of a vegetable substance without the loss of any of the mineral constituents, the author has devised a special form of cover for an ordinary platinum basin. This permits the admission of air or oxygen during the incineration, warms the gas, and then introduces it quietly round the periphery. The cover has a tube in the centre by which it can be connected with a condenser (of Jena glass), and the latter is joined to an absorption apparatus (to be described hereafter) in which milk of lime is placed, and through which air can be aspirated by a pump. Any mineral substances volatilised during the incineration are arrested in this absorber. The preliminary carbonisation of the substance is assisted by adding a solution of calcium acetate and oxide and drying on the sand-bath before burning. After charring in the open basin, the cover and absorption apparatus are adjusted, a slow current of air established, and the incineration carried as far as is possible at a dull red heat, washed oxygen being admitted towards the close. Should any particles of carbon still remain unburnt, the ash is moistened with pure (3 per cent.) hydrogen peroxide, dried, and reheated. M. J. S.

Commercial Hydrogen Peroxide. By GEORGES ARTH (*Chem. Centr.*, 1901, ii, 445—446; from *Mon. sci.*, [iv], 15, ii, 435—436).—For the detection of oxalic acid, said to be occasionally met with in the commercial product, the following process is recommended: 100—200 c.c. of the sample are rendered faintly alkaline with ammonia, and calcium chloride is added. The precipitated calcium oxalate is washed with ammoniacal water until the acidified washings are no longer affected by permanganate; the oxalate is then titrated as usual. According to the author, the oxalate is often contaminated with hydrated calcium dioxide, and the titration, therefore, becomes uncertain.

For titrating the peroxide, a solution containing 5.659 grams of potassium permanganate per litre is recommended, as each c.c. of this corresponds with 1 c.c. of available oxygen by volume in the sample.

L. DE K.

Oxidation of Nitrogen as a Source of Error in the Estimation of Nitrogen and Methane. By ALFRED H. WHITE (*J. Amer. Chem. Soc.*, 1901, 23, 476—482).—Oxides of nitrogen soluble in aqueous potassium hydroxide are always formed in explosion analysis. With Bunsen's eudiometer, the error is only trifling, but when Hempel's pipette is used it may amount to 1 per cent. or more, particularly if methane is present. The error may, however, be reduced to a minimum by keeping the explosive ratio between four and three. The method of Dennis and Hopkins (burning the mixture of methane or hydrogen with air by means of a red hot platinum spiral) also tends to yield soluble oxides of nitrogen if the spiral is heated too strongly or too long.

L. DE K.

Estimation of Sulphur in Coal, Bitumen, Pyrites, Roasted Ores, Products of Scorification, &c. By HENRI PELLET (*Ann. Chim. anal. appl.*, 1901, 6, 281—285).—One gram of the dry and

finely powdered substance is mixed with an oxidising flux composed of 20 grams of dry sodium carbonate and 10 grams of potassium nitrate, and the whole fused in a platinum crucible, avoiding the use of coal-gas. The mass is then dissolved in water, the filtrate acidified with hydrochloric acid, and precipitated with barium chloride; the ignited barium sulphate is washed and reweighed.

To estimate volatile, so-called injurious, sulphur, another gram of the sample is roasted, and the sulphur in the residue, which exists as sulphate, is again estimated by boiling the mass with dilute hydrochloric acid and adding barium chloride to the filtrate. The difference between the two determinations represents the volatile sulphur.

L. DE K.

Rapid Estimation of Arsenious Oxide in Paris Green. By SAMUEL AVERY and H. T. BEANS (*J. Amer. Chem. Soc.*, 1901, 23, 485—486).—0.2—0.3 gram of the finely powdered sample is put into a 300 c.c. beaker, mixed with 25 c.c. of water, and hydrochloric acid added drop by drop until solution is just effected. After adding sodium carbonate solution until a slight permanent precipitate has formed, 2 or 3 grams of sodium potassium tartrate dissolved in water are added; the whole is diluted to 200 c.c., some solid sodium hydrogen carbonate and starch solution are added, and the arsenious oxide is titrated as usual with standard iodine. The slight blue colour caused by the copper does not sensibly interfere with the titration.

L. DE K.

Estimation of Cyanides and Cyanates. By ERNEST VICTOR (*Zeit. anal. Chem.*, 1901, 40, 462—465).—The following process is simpler than that of Mellor (this vol., ii, 202). A 10 per cent. solution of the mixture of cyanide and cyanate is prepared, and two quantities of 10 c.c. each are mixed with excess of $N/10$ silver nitrate in 100 c.c. flasks. One flask is then filled to the mark with distilled water, and the excess of silver titrated in an aliquot part of the filtrate by Volhard's thiocyanate process. To the other flask, some dilute nitric acid is added, by which the silver cyanate is dissolved, and the silver in the solution is estimated as before. The difference between the two titrations gives the cyanate. If carbonates are present, they are first removed by barium nitrate; the suggestion of Feldtmann and Bettel (*Proc. Chem. Metallurg. Soc. South Africa*, 1894—1897, 1, 274) to convert them into hydrogen carbonates by adding aqueous carbonic acid is not satisfactory, since the precipitation of silver carbonate is not altogether prevented. It is not necessary to work with solutions cooled to near 0°, for even at 25° a solution of cyanate remained constant in strength for about 3 hours.

M. J. S.

Estimation of Calcium Oxide in Soils. By EDUARD HOTTER (*Chem. Centr.*, 1901, ii, 235; from *Zeit. landw. Versuchs-Wes. Oesterr.*, 4, 632—636).—Twenty grams of the dried and sifted soil are introduced into a 250 c.c. flask and heated for half an hour on the water-bath with 50 c.c. of 20 per cent. acetic acid; the solution is diluted to 250 c.c., and after 12 hours 200 c.c. of the clear liquid are siphoned off. The solution is precipitated with ammonium oxalate and the calcium oxalate converted into oxide by ignition. It is then purified by

dissolving it in very dilute nitric acid and reprecipitating the calcium in ammoniacal solution. When calculating the result, it may be assumed that 20 grams of the soil occupy a volume of 10 c.c. L. DE K.

Occlusion of Magnesium Oxalate by Calcium Oxalate. Solubility of Calcium Oxalate. By THEODORE W. RICHARDS, CHARLES F. McCAFFREY, and HAROLD BISBEE (*Zeit. anorg. Chem.*, 1901, 28, 71—89).—On precipitation of calcium oxalate in presence of magnesium salts, it is known that magnesium oxalate is always carried down, and it has already been suggested (*Abstr.*, 1900, ii, 472) that this occlusion is dependent upon a distribution of undissociated magnesium oxalate between the solution and the solid substance. In order to test this, experiments have been carried out in which the concentration of the undissociated magnesium oxalate was decreased by addition of a highly dissociated substance capable of forming complex ions with the magnesium or oxalic acid, and the amount of magnesium carried down with the calcium oxalate was determined. It was found that as the concentration of the undissociated magnesium oxalate was diminished, proportionately less of it was found in the precipitated calcium oxalate.

The authors recommend the following process for the separation of calcium from magnesium in solutions which should not be more than 1/50 normal with respect to magnesium. To the solution, an amount of ammonium chloride equivalent to 10 times the amount of magnesium present is added, and sufficient oxalic acid, to which some hydrochloric acid has previously been added, to completely precipitate the calcium. The solution is then boiled, and very dilute ammonia is added in small quantities at a time until the whole is exactly neutral to methyl-orange. A large excess of ammonium oxalate is now added, and the mixture, after standing for 4 hours, is filtered and washed with very dilute ammonium oxalate.

The solubility of calcium oxalate in pure water (0.0068 gram per litre at 25°; 0.00955 gram at 50°, and 0.0140 gram at 95°) is so large as to cause an appreciable error in exact analysis; in ammonium oxalate solution, it is very considerably less soluble.

J. McC.

Action of Sodium Thiosulphate on Solutions of Metallic Salts at High Temperatures and Pressures. By JOHN T. NORTON, jun. (*Amer. J. Sci.*, [iv], 12, 115—122).—At temperatures ranging from 140° to 200°, salts of nickel, cobalt, iron, zinc, lead, mercury, silver, copper, cadmium, antimony, and bismuth are completely precipitated as sulphides by sodium thiosulphate; manganese is only partially precipitated, and arsenic does not seem to be precipitated from an arsenate without the addition of acid. Salts of aluminium, chromium, titanium, zirconium, and thorium are completely precipitated as hydroxides, whilst beryllium is only partially precipitated as hydroxide. Salts of selenium and tellurium are reduced, and the elements are precipitated. In all cases, the precipitates are mixed with sulphur.

Quantitative experiments showed that whilst salts of aluminium and chromium are not completely precipitated by boiling during a reasonable time with sodium thiosulphate under atmospheric pressure,

a quantitative precipitation results when they are heated under 20 atmospheres pressure in a digester; in order to avoid high results, however, it is necessary to restrict the quantity of thiosulphate used. Salts of zirconium and titanium are precipitated quantitatively by boiling for a few minutes under atmospheric pressure.

T. M. L.

[Precipitation of Zinc and Cadmium by Hydrogen Sulphide in Acid Solution.] By W. N. STULL (*J. Amer. Chem. Soc.*, 1901, 23, 508—514).—The equilibrium in the precipitation of zinc in acid solution by means of hydrogen sulphide is only reached after several hours, and at 20° zinc ceases to be precipitated when the solution contains about 5.25 per cent. of free sulphuric acid. Agitation and change of temperature within moderate limits are without appreciable influence on the rate of precipitation of zinc sulphide or on the final equilibrium.

Cadmium is quickly and completely precipitated at 20° by hydrogen sulphide from a solution containing any quantity of sulphuric acid. At 85°, the cadmium is completely precipitated when the solution contains up to 23 per cent. of sulphuric acid, but if the current of hydrogen sulphide is then stopped, the solution, as it loses this gas, redissolves the precipitate. The results indicate that the complete precipitation of cadmium as sulphide depends on the saturation of the solution with hydrogen sulphide, the temperature and concentration of the acid being only of secondary importance.

J. McC.

Estimation of Small Quantities of Zinc in Iron-Spar. By J. FLATH (*Chem. Zeit.*, 1901, 25, 564—565).—Three to five grams of the powdered ore are dissolved in hydrochloric acid, the solution is diluted with 150—200 c.c. of water and mixed with ammonia in slight excess, 15 c.c. of glacial acetic acid are added, and a current of hydrogen sulphide is passed. Besides a little iron, the precipitate contains any zinc, copper, or lead which may have been present in the ore. The sulphides are washed on a filter with water containing a little hydrogen sulphide, and then dissolved in nitro-hydrochloric acid. The solution is mixed with 10 c.c. of dilute sulphuric acid (1:1), evaporated down, the residue dissolved in 100 c.c. of water, and the copper precipitated by boiling with 10—15 c.c. of solution of sodium thiosulphate (1:10). The filtrate is boiled with 5 c.c. of nitric acid, evaporated to a small bulk, and now freed from iron by a double precipitation with ammonia in the presence of bromine. The zinc is finally titrated in the ammoniacal solution as usual.

L. DE K.

Volumetric Estimation of Zinc. By PERCY H. WALKER (*J. Amer. Chem. Soc.*, 1901, 23, 468—470).—The zinc solution is mixed with ammonium chloride and a large excess of ammonia and of sodium hydrogen phosphate is added. After filtering off from any insoluble phosphates, the ammonia is nearly neutralised with hydrochloric acid, which point is indicated by the solution becoming milky. After heating to 75°, more dilute acid is added drop by drop until the liquid is only faintly alkaline to delicate litmus paper. After waiting five minutes, the crystalline precipitate is collected on a filter and washed with cold water until the washings are practically free from chlorine;

the filter is returned to the beaker, the precipitate of zinc ammonium phosphate is dissolved in a known volume of standard sulphuric acid, and the excess of this titrated with standard alkali, using methyl-orange as indicator. One c.c. of normal acid represents 0.0327 gram of metallic zinc.

I. DE K.

A [Microchemical] Test for Indium. By P. KLEY (*Chem. Zeit.*, 1901, 25, 563).—The best test for indium is the formation of the double chloride of indium trichloride and rubidium chloride. It forms colourless crystals of an octahedral character, which, however, polarise well and belong to the rhombic system. Directions are given for the separation of indium and the formation of the chloride, by which as little as 0.00024 mgr. of indium can be detected. The microchemical reaction for indium described by Huyse (Abstr.^f 1900, ii, 246) is untrustworthy.

R. H. P.

Modified Williams' Method for Estimating Manganese. By RANDOLPH BOLLING (*J. Amer. Chem. Soc.*, 1901, 23, 493—496).—The modification consists in removing the silica by means of 10 c.c. of hydrofluoric acid, which are added when dissolving the sample of iron or iron ore in nitric acid. The liquid is then heated, as usual, with strong nitric acid and potassium chlorate, and the manganese dioxide collected on an asbestos filter pad. Owing to the absence of silica, it may be rapidly freed from the acid solution by washing. The asbestos is now returned to the beaker, and the precipitate dissolved by adding 50 c.c. of standardised solution of iron sulphate (20 grams of the pure salt, 200 c.c. of sulphuric acid, and water to make up to 2 litres). The excess of ferrous iron is then titrated with potassium permanganate solution, 1 c.c. of which represents 0.0056 gram of iron.

As it is doubtful whether all the manganese is really in the state of dioxide, and also on account of the presence of carbon in the samples and the use of asbestos, the author prefers checking his solutions by means of a sample of iron the manganese of which has been accurately estimated, for example, by Gibbs' pyrophosphate method.

L. DE K.

Volumetric Estimation of Chromium Oxide in Chromium Oxide Mordants. By R. HARTMANN (*Chem. Zeit.*, 1901, 25, 564).—The following method is recommended. About 1 gram of the mordant (chromium acetate of sp. gr. 1.17) is diluted with 10—15 c.c. of water, and mixed with aqueous sodium hydroxide until the precipitate has redissolved. The liquid is heated on the water-bath, and sodium dioxide added until the solution has assumed a bright yellow colour. After evaporation to dryness, the mass is dissolved in 500 c.c. of water, excess of dilute sulphuric acid added, and the chromic acid estimated as usual by means of ferrous ammonium sulphate and potassium permanganate. If the mordant should contain other organic matter, this must be first destroyed by treatment with nitric acid, or potassium chlorate and hydrochloric acid, and subsequent evaporation with sulphuric acid.

L. DE K.

Use of Diphenylcarbazide for the Detection of Chromic Acid in Cotton Dyed with Chrome Yellow. By PAUL CAZENEUVE (*Bull. Soc. Chim.*, 1901, [iii], 25, 761—762).—The fibre is decolorised by

treatment with potassium hydroxide, and the test applied as previously described (Abstr., 1900, i, 627).

N. L.

Alkaline Waters from the Chalk. By WALTER W. FISHER (*Analyst*, 1901, 26, 202—208).—Tables are given containing a large number of analyses of well waters from different parts of England. Those obtained from uncovered chalk wells show no alkalinity to speak of after boiling, but when the chalk is covered with a layer of clay, the alkalinity becomes very marked, owing to the presence of alkali carbonate. The sodium carbonate is most likely formed by the action of sodium silicate from the clay on the calcium hydrogen carbonate contained in the water, but the subject is being further investigated.

L. DE K.

Estimation of Carbon Dioxide in Water. By JOSEPH W. ELLMS and JAY C. BENEKER (*J. Amer. Chem. Soc.*, 1901, 23, 405—431).—A lengthy investigation as to the respective merits of the original Pettenkofer method, Trillich's modification of the same, and the Lunge-Trillich or Seyler's method for the estimation of carbon dioxide in its various forms.

On account of the ease and rapidity of manipulation, the non-interference of magnesium salts and its greater accuracy, the last process is to be preferred for the estimation of carbon dioxide in waters.

L. DE K.

[Improvements in the] **Estimation of Ammonia and Nitric and Nitrous Acids in Drinking Waters.** By LUDWIG W. WINKLER (*Chem. Zeit.*, 1901, 25, 586—587. Compare Abstr., 1899, ii, 805).—**Ammonia.**—The Rochelle salt solution required is now prepared by dissolving 50 grams of the salt in 100 c.c. of warm water, and adding 5 c.c. of the author's Nessler solution; this not only preserves the solution, but also frees it from traces of ammonia. After a few days, it should be filtered through cotton-wool. Ordinary water free from ammonia may be used instead of distilled water for the comparison test.

Nitric Acid.—The recommendation is now made that to the sample and to the comparison water about 0.03 gram of solid brucine should be added, and dissolved by means of a drop of sulphuric acid before adding the bulk of the acid. Instead of using ordinary flasks, glass tubes holding 50 c.c., and having a diameter of 3 cm., are recommended, and the colours are compared as in the Nessler test.

Nitrous Acid.—The whole of the 5 grams of potassium hydrogen carbonate, in crystals, is added in one quantity; after 1 minute, 0.2 gram of potassium iodide is added, and the liberated iodine titrated after 5 minutes. Sterilised starch water without any preservative is recommended.

L. DE K.

Estimation of Sulphuric Acid in Drinking Waters. By C. HARTLEB (*Chem. Centr.*, 1901, ii, 320; from *Pharm. Zeit.*, 46, 501—502).—After a preliminary test, 100 c.c. of the sample are boiled with 10 c.c. or more of *N*/10 barium chloride solution. The excess of the latter is titrated by adding a solution containing 9.8 grams of potassium chromate per litre. The end reaction is noticed by testing a few drops of the liquid with *N*/10 silver nitrate. The checking of the chromate and the barium solutions is also effected with the aid of silver

nitrate as indicator. The sulphuric acid is calculated from the difference between the potassium chromate consumed before and after adding the barium chloride to the water. L. DE K.

Estimation of Sulphuric Acid in Natural Waters. By LUDWIG W. WINKLER (*Zeit. anal. Chem.*, 1901, 40, 465—469).—A very rapid estimation of sulphuric acid in potable waters, with sufficiently close approximation for hygienic purposes, can be made by converting the method of Andrews (Abstr., 1890, 414) into a colorimetric one. One hundred and fifty or 200 c.c. of the water are acidified with 5—10 drops of hydrochloric acid and 0.1—0.2 gram of pure barium chromate is added; the liquid is heated to boiling, then completely cooled, and mixed with a very small excess of sodium hydroxide. It is then filtered through dry double filters, the first turbid portion rejected, and 100 c.c. of the clear filtrate are compared with 100 c.c. of alkaline water to which potassium dichromate solution is added from a burette. The dichromate solution contains 1.839 gram per litre: 1 c.c. is equivalent to 0.001 gram of sulphur trioxide. A correction of 0.7 c.c. is to be made to allow for the solubility of barium chromate in dilute alkali.

M. J. S.

Refractometric Method of Determining Alcohol and Solid Matter in Beer. By ARTHUR R. LING and THOMAS HENRY POPE (*J. Fed. Inst. Brewing*, 1901, 7, 170—181).—The authors have determined the amount of solid matter and alcohol in a number of English beers of various kinds by (1) the ordinary distillation method and (2) Tornøe's refractometric method, which dispenses with distillation, the measurements made being (a) the sp. gr. of the beer at a normal temperature (17.5°) which is obtained by the use of very accurate hydrometers reading direct to 0.0001; (b) the refractive index of the beer for sodium light at the same normal temperature. The latter magnitude is obtained with the help of a Hallwachs' double prism, which contains the beer in one compartment and water in the other, and is mounted on a spectrometer stand designed by Tornøe. The instrument is so constructed that only one reading is necessary to give the value of double the angle of deviation suffered by a ray of sodium light passing in the limiting position from water into beer. From this angle, the index of refraction of the beer may, if necessary, be calculated, but tables have been constructed which give the percentage of alcohol and extract in the beer when the values of the angle and of the sp. gr. are known. This process, which can be carried out in about 10 minutes, gives results agreeing well with those obtained by the ordinary distillation method, the agreement being equally good in the case of beers brewed with large proportions of malt substitutes.

T. H. P.

Sulphurous Acid in Wines. By G. PATUREL (*Ann. Agron.*, 1901, 27, 305—317).—After criticising existing methods, the following process is recommended. Fifty c.c. of the sample of red wine are introduced into a generating flask and mixed with 5 c.c. of dilute sulphuric acid (1:2). A slow current of carbon dioxide, which is first passed through a washbottle containing a solution of sodium hydrogen carbonate, is transmitted through the wine and is then made to bubble

through 50 c.c. of recently boiled water containing a little starch solution. Over the beaker containing the liquid is placed a burette filled with solution of iodine of such a strength that 1 c.c. represents exactly 0.0005 gram of sulphur dioxide; the iodine is constantly added in slight excess while the gas is passing. When, finally, no further discoloration takes place, the experiment is stopped and the number of c.c. of iodine consumed is noted. The operation rarely takes more than 30 minutes.

The process shows only the free sulphur dioxide and not that portion which has combined with any aldehyde present; the latter must be estimated by the distillation process.

L. DE K.

New Indicator for Determining the Total Acidity of Wines. By E. G. RUNYAN (*J. Amer. Chem. Soc.*, 1901, 23, 402—405).—The author uses the indicator proposed by Lachaux which is prepared as follows: 3.1 gram of corallin (rosolic acid) are dissolved in 150 c.c. of 90 per cent. alcohol and carefully neutralised; to this is then added 0.5 gram of malachite green dissolved in 50 c.c. of alcohol. This indicator turns a purple colour with alkalis and is changed to green by acids. Ten c.c. of the sample of wine are diluted with 300 c.c. of boiling water, boiled for a moment to expel carbon dioxide, and cooled to 75°; 10 drops of the indicator are added, and then an excess of *N*/10 sodium hydroxide. The excess of alkali is then titrated by means of *N*/10 acid, the change in colour being best observed by transmitted light. The indicator answers also for estimating the acidity of beet molasses, vinegars, and ciders.

L. DE K.

Estimation of Volatile Acids and Chlorides in Wines. By ALBERT KLEIBER (*Chem. Centr.*, 1901, ii, 240; from *Schweiz. Wochschr. Pharm.*, 39, 295—300).—The German method of distilling 100 c.c. of wine in a current of steam and collecting 200 c.c. of distillate for titration is sufficiently accurate; nothing is gained by increasing the volume of the distillate. When 100 c.c. of wine are distilled in such a manner that 68 c.c. are collected in about 20 minutes, the distillate contains the bulk of the volatile acids. After adding water to make up to 100 c.c., 50 c.c. are used for titration.

To estimate chlorine, the wine is neutralised with soda, evaporated to dryness, and the residue charred. The mass is then extracted with water, and the filtrate neutralised with nitric acid and titrated with silver nitrate as usual.

L. DE K.

Elimination and Estimation of Water in Oils, Fats, and Waxes. By CHARLES B. DAVIS (*J. Amer. Chem. Soc.*, 1901, 23, 487—488).—In order to prevent loss by foaming or spirting when drying fats or oils containing water, the author uses a wide-mouth, glass-stoppered weighing bottle, which is half filled with a coil of thick filter paper. The whole is first dried in the air-oven at 110° and weighed; a sufficiency of the sample is introduced, and, after ascertaining its weight, the whole is again dried at 110° and reweighed. As the fat is absorbed by the paper, the drying proceeds quietly; samples liable to oxidation should be dried in a current of carbon dioxide or hydrogen.

Small samples may be dissolved in ether, the solution poured on to the filter paper, the ether evaporated at a low temperature, and the drying afterwards carried out at 110°. L. DE K.

Determination of the Saponification Number of Fats. By OTTO SCHMATOLLA (*Chem. Centr.*, 1901, ii, 239—240; from *Apoth. Zeit.*, 16, 425).—Five grams of the oil are boiled with 20 c.c. of normal potassium hydroxide solution until a stiff paste is obtained, 20 c.c. of dilute alcohol are added, and the whole warmed until the mass becomes soft. After dissolving the mass in as little dilute alcohol as possible, 20 c.c. of strong brine are added, and the whole heated, cooled, and, when cold, filtered through linen. The soap is well pressed and once more treated with brine. The united salt solutions are filtered through paper, and the excess of alkali titrated with normal hydrochloric acid, methyl-orange being used as indicator. The difference represents the amount of potassium hydroxide absorbed by the fat. L. DE K.

Cryoscopic Distinction between Butter and Margarine. By W. PESCHGES (*Arch. Pharm.*, 1901, 239, 358—363).—The distinction between butter and margarine, by means of cryoscopic determinations of the molecular weight in benzene (Pouret, *Abstr.*, 1899, ii, 710), is found by the authors not to be valid. The values for the molecular weights obtained by Pouret, namely, 640 for butter and 840 for margarine, do not agree with those calculated from the Köttstorfer saponification numbers, which give 716—763 for butter, and 840—875 for margarine. When the molecular weights are determined by the boiling point method in benzene, still lower values (387—413) are found for the molecular weight of butter. With ether as solvent, the molecular weight is the same as that calculated from the Köttstorfer numbers. The latter, however, can be determined with far greater accuracy than the molecular weight. K. J. P. O.

Estimation of Urea in Urine. By OTTO FOLIN (*Zeit. physiol. Chem.*, 1901, 32, 504—514).—The urine (3 c.c.) is boiled with 20 grams of hydrated magnesium chloride and 2 c.c. of concentrated hydrochloric acid in a small reflux apparatus for some 30 minutes. After careful dilution, 7 c.c. of 20 per cent. sodium hydroxide are added to liberate magnesium hydroxide, and the ammonia distilled over in the usual way; this operation requires, as a rule, about 60 minutes. Corrections must be made for the ammonia contained in the magnesium chloride, and also for that originally present in the urine.

The Mörner-Sjöquist method for obtaining from urine filtrates which contain all the urea is preferable to the Pflüger-Gumlich phosphotungstic acid method.

It appears probable that the methods described above may be used for estimating urea in urine without the previous removal of other nitrogenous substances. J. J. S.

Formalinsulphuric Acid as a Reagent for Alkaloids. By CURT ELIAS (*Chem. Centr.*, 1901, ii, 57; from *Pharm. Zeit.*, 1901, 46, 394—441).—The author has applied the formalinsulphuric acid test to a number of other alkaloids (compare Wirthle, this vol., ii, 363). In

addition to morphine, codeine and apomorphine gave the violet colour. Narcotine was also coloured distinctly violet; the colour became olive-green, and finally yellow. Papaverine, not absolutely pure, but giving with sulphuric acid a passing faint violet, assumed a wine-red colour which, after some time, became yellow round the edges, and then turned first a dirty brownish-red, and afterwards dark orange. Thebeine, narceine, quinine, cinchonine, arecoline, physostigmine, pilocarpine, caffeine, cocaine, brucine, strychnine, hyoscyne, atropine, and veratrine only gave the ordinary reactions. L. DE K.

Assay of Coca. By WILLIAM R. LAMAR (*Amer. J. Pharm.*, 1901, 73, 125—131).—Twenty-five grams of the powdered leaf are placed into a suitable vessel, moistened with 25 c.c. of 2 per cent. solution of ammonia, and allowed to macerate for half an hour, the vessel being well covered. The mass, which should still have a distinct odour of ammonia, is now gradually mixed with 75 c.c. of petroleum, the jar is again covered and left for an hour, stirring at intervals of 10 or 15 minutes. The mass is now transferred to a cylindrical percolator of about 500 c.c. capacity, slightly plugged with absorbent cotton. The percolation, which should proceed at the rate of 6 or 8 drops per minute, is continued until about 450 c.c. of petroleum have been collected. The percolate is then transferred to a large separating funnel, and shaken for 10 minutes with 25 c.c. of *N*/10 hydrochloric acid. When the two layers have separated, the acid is drawn off, and the shaking with acid is twice repeated. The united acid liquids, which contain the alkaloids, are shaken in another separator with 20 c.c. of ether to remove oily and colouring matters; this is repeated in a fresh separator, using 15 c.c. of ether. The purified liquid is transferred to a third separator; to it are added the washings obtained by shaking the first lot of ether with two portions of 5 c.c. of water, and using the same for washing the second lot of ether.

The aqueous liquid is now rendered slightly alkaline by adding 8 to 9 c.c. of 2 per cent. ammonia, and then shaken three times in succession with respectively 40, 30, and 30 c.c. of ether; each time the aqueous layer is drawn off into a clean separator, the ether is emptied into a tared beaker, and the separator is rinsed with ether, which is then used for the next extraction. When the ether has evaporated, the residue is dried for 3 hours at 60° and weighed. The alkaloids so obtained should be beautifully crystalline in appearance and almost colourless. L. DE K.

Assay of Opium. By A. B. STEVENS (*Pharm. Arch.*, 1901, 4, 81—86).—A modification of the U.S.P. method. Four grams of opium powder are mixed in a mortar with 1.5 grams of calcium oxide and 10 c.c. of water to a paste; another 19 c.c. of water are added, and the whole stirred frequently for half an hour. After filtering, 15 c.c. of the liquid are transferred to a 60 c.c. bottle, 4 c.c. of alcohol and 10 c.c. of ether are added, and the mixture is well shaken; 0.5 gram of ammonium chloride is added, and the mixture frequently shaken for half an hour.

After 12 hours, the ethereal layer is poured into a small funnel, the neck of which has been closed with a piece of absorbent cotton. The

bottle is rinsed with 10 c.c. of ether, and when this has passed through, the contents of the bottle are poured into the funnel. Without trying to remove all the crystals from the bottle, this is washed with water saturated with morphine until the washings are colourless. When the crystals have drained, the funnel is placed in the bottle, the cotton is lifted by means of a small glass rod drawn out to a curved point, and the crystals are rinsed into the bottle by means of 12 c.c. of $N/10$ sulphuric acid, using the cotton on the end of the rod to detach any adhering crystals. The cotton is put into the flask, the stopper inserted, and the whole shaken until the morphine is dissolved. The solution is transferred to a 100 c.c. flask, and the bottle and funnel washed with water in sufficient quantity to make the acid solution up to exactly 100 c.c. Fifty c.c. of this are put into a 100 c.c. flask, and Wagner's reagent is added in small quantities until the precipitate has settled and a clear, dark-red solution is obtained, when the whole is diluted to the mark. Fifty c.c. of the filtrate (0.5 gram of opium) are now decolorised by means of a 10 per cent. solution of sodium thiosulphate, and the excess of acid is then titrated with $N/10$ potassium hydroxide, using phenolphthalein as indicator. The number of c.c. of $N/10$ acid consumed by 1 gram of opium multiplied by 3.007 gives the percentage of morphine. This result should be corrected by adding 1.12 per cent. of morphine lost during the estimation.

Instead of the titration process being used, the crystals may also be dried and weighed, as they may be taken to be practically pure.

L. DE K.

Differentiation between Albumins, Syntonins, Albumoses, and Peptones of Muscular Tissue. By BILTÉRYST (*Ann. Chim. anal. appl.*, 1901, 6, 241—243).—The author has prepared soluble albumins, syntonins, albumoses, and peptone from the muscular tissue of the ox, and gives a table showing their different behaviour towards reagents.

Solubility in water. Albumins are partly soluble, the others are dissolved. *Solubility in alcohol of 95 per cent.* Only peptone is fairly soluble. *Action of heat.* Albumins only are coagulated. *Acetic acid.* Albumins and syntonins only are precipitated. *Hydrochloric acid.* Albumins and syntonins only are precipitated. *Nitric acid.* Albumins are precipitated, syntonins also, but the precipitate redissolves on heating; albumoses give a slight opalescence disappearing on heating, peptone is not precipitated. *Potassium ferrocyanide in the presence of acetic acid.* Albumins and syntonins are precipitated, albumoses give a faint turbidity, peptone is not affected. *Ammonium sulphate to saturation.* Albumins, syntonins, and albumoses only are precipitated. *Biuret reaction.* Peptone only gives a rose coloration, also in alcoholic solution.

L. DE K.

General and Physical Chemistry.

Sensitiveness of the Reactions based on Spectrum Analysis. By W. SCHULER (*Ann. Phys.*, [iv], 5, 931—942).—For the metals in the first two groups of Mendeléeff's system, the sensitiveness of flame and spark reactions diminishes with increasing atomic weight. For the salts of a given metal, the sensitiveness diminishes with increasing atomic weight from chloride to iodide, and in the oxy-salts with increasing number of oxygen atoms. When two metals are present, they are mutually affected, but the sensitiveness of a light metal is much more diminished than that of a heavy metal. When hydrogen chloride or chloroform vapour is mixed with the burning gas, the intensity of the flame spectrum of a metal is seriously diminished, the effect of chloroform vapour being more marked than that of hydrogen chloride (compare Smithells, *Phil. Mag.*, 1895, 39, 122). J. C. P.

Spectra of Hydrogen, and some of its Compounds. By JOHN TROWBRIDGE (*Phil. Mag.*, 1901, [vi], 2, 370—379. Compare Abstr., 1900, ii, 701).—The author's experiments lead him to the conclusion that pure dry hydrogen is an insulator, and that the passage of electricity through hydrogen, nitrogen, oxygen, and their gaseous compounds is conditioned by the water vapour present. The passage of the current is electrolytic in character; for example, when a strong, steady current is passed between pure copper electrodes in rarefied hydrogen (not perfectly dry), copper is deposited in a lustrous state on the walls round the negative electrode, and an olive-green oxide of copper is deposited on the walls round the positive electrode. Although the author has not obtained the spectra of hydrogen apart from water vapour and hydrocarbons, the brilliancy of the light of hydrogen tubes diminishes as the dissociation of water vapour proceeds and the resistance of the tube increases. J. C. P.

Spectrum of Cyanogen. By EDWARD C. C. BALY and H. W. SYERS (*Phil. Mag.*, 1901, [vi], 2, 386—391).—A description of experiments confirmatory of Smithells' view (this vol., ii, 366) that the Swan spectrum is the spectrum of carbon monoxide. In particular, it has been shown that a cyanogen spectrum can be obtained without a trace of the carbon spectra. To get the cyanogen in a state of purity, the gas obtained by heating mercuric cyanide was frozen by means of liquid air, and any non-condensable residue pumped off. The pure cyanogen obtained by volatilisation of the frozen mass gave a beautiful spectrum, with equidistant flutings through the red and yellow. The admission of air or oxygen into the tube was at once followed by the appearance of the carbon spectra. The rapid polymerisation of the cyanogen under the influence of the discharge was a source of trouble, but this was got over by passing a constant slow stream of the gas into the tube. It was further necessary to observe the discharge 'end on,' on account of the deposition of paracyanogen on the walls of the tube. J. C. P.

Luminescence Spectra of the Rare Earths. By E. BAUR and R. MARC (*Ber.*, 1901, 34, 2460—2466).—The luminescence spectra attributed by Muthmann and Baur (*Abstr.*, 1900, ii, 544) to yttrium, gadolinium, and lanthanum, are now shown to be produced by small quantities of erbium, neodymium, and praseodymium present as impurity. The oxides and salts of yttrium, gadolinium, and lanthanum have, when pure, no discontinuous spectrum. The authors have recorded all the lines and bands observed for solutions of erbium, neodymium, and praseodymium in calcium oxide, yttria, and the corresponding sulphates. J. C. P.

Photochemical Decomposition of Hydrogen Iodide: a Contribution to the Knowledge of Sensitising Action. By JOHANNES PINNOW (*Ber.*, 1901, 34, 2528—2543. Compare this vol., ii, 368).—When solutions of potassium iodide and sulphuric acid are kept in the dark, the rate of oxidation of the hydrogen iodide, as measured by titration with thiosulphate, does not increase proportionately to the concentration of the sulphuric acid; when, however, the solutions are exposed to sunlight, the amount of iodine liberated is proportional to the sulphuric acid, provided the potassium iodide concentration is not above 1 gram per litre; the accelerating influence of light is most evident in the more dilute solutions of potassium iodide. The liberation of iodine, both in the dark and in the light, is about twice as rapid when hydrochloric acid takes the place of sulphuric acid. The liberation of iodine from a mixture of potassium iodide and phosphoric acid is only slightly accelerated by light. The oxidation of a mixture of potassium iodide and sulphuric acid is accelerated, generally by quinine, always by acridine, the fluorescence in both cases being diminished. Excess of sulphuric acid, however, both restores the fluorescence and checks the accelerating influence of the sensitiser. J. C. P.

The Diazotype Process in Photographic Printing. By ARTHUR G. GREEN, CHARLES F. CROSS, and EDWARD J. BEVAN (*Ber.*, 1901, 34, 2495).—A correction of Ruff and Stein's views (this vol., i, 619) as to the authors' work in the same direction (*Abstr.*, 1891, 138). W. A. D.

Determination of the Dielectric Constants of some Substances of the Pyridine and Piperidine Series by Drude's Method. By R. LADENBURG (*Zeit. Elektrochem.*, 1901, 7, 815—817).—The determinations were made by Drude's electrical oscillation method, and gave the following values of the dielectric constants at 22°:—Pyridine, 12·56; α -picoline, 9·46; β -picoline, 10·71; 2-ethylpyridine, 8·56; α -conyryne (2-propylpyridine), 7·36; 2-isopropylpyridine, 7·68; 2-methyl-5-ethylpyridine, 7·95; 2:6-dimethylpyridine, 7·23; 2:4:6-trimethylpyridine, 6·64; piperidine, 4·33; α -pipecoline, 3·55; d -coniine, 3·03; 2-isopropylpiperidine, 2·95; 2:4:6-trimethylpiperidine, 3·06; 1-methylpiperidine, 2·90; 1-ethylpiperidine, 2·49; 1-isopropylpiperidine, 2·26; 1:2-dimethylpiperidine, 2·17.

The introduction of an alkyl group diminishes the dielectric constant, the diminution being greatest in the 1-position and least in the

4-position; it also increases with the number of carbon atoms in the side chain. T. E.

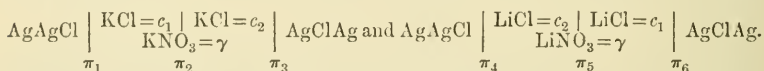
Electrical Properties of Chromium during Dissolution in Acids. By EBERHARD BRAUER (*Zeit. physikal. Chem.*, 1901, 38, 441—486).—The dissolution of 'active' chromium is attended by a remarkable periodicity in the rate of evolution of hydrogen, whilst active chromium also exhibits changes in its electric potential as the current produced by a cell of active chromium and platinum immersed in acid periodically varies. The author describes apparatus by which both these variations can be simultaneously studied; a cell of active and inactive chromium in hydrochloric acid was employed, and the variations of hydrogen evolution and of current strength produced oscillations of two reflecting mirrors, whereby two permanent records on photographic paper were obtained in juxtaposition. It was found that the two variations were intimately connected, perfectly analogous curves being obtained for both, although evidence of variations in the electrical properties was obtained when the evolution of hydrogen was apparently constant. The influence of temperature was studied; no periodicity was observed at 6°, it was very marked at 20°, and an increase to 31° caused a great increase in the frequency. The effect of variation of concentration of the acid was also investigated; the frequency was found to increase with concentration, but to be no longer apparent when the acid was too strong. A cell was also employed in which a current of the acid was maintained, so that variations of composition at the electrodes were avoided; in some cases, a sufficiently rapid flow of acid caused a cessation of the periodicity. It was found that a piece of pure chromium was inactive, but that activity was induced by rubbing with a piece of cadmium. Slight activity was also occasioned by the addition of sulphides or arsenic to the acid, this addition having further very great influence on the periodicity of active chromium. The author considers that the explanation of these phenomena is to be looked for in the variations of *E.M.F.* associated with the different oxidation stages of chromium (Luther, this vol., ii, 301. Compare Hittorf, *Abstr.*, 1898, ii, 363; 1900, ii, 127; Ostwald, *Abstr.*, 1900, ii, 730; 1901, ii, 24). L. M. J.

Equilibria at Gas Electrodes. By EMIL BOSE (*Zeit. Elektrochem.*, 1901, 7, 817—821).—The chemical reactions occurring at gas electrodes are usually complicated by secondary changes. The hydrogen electrode is free from these, but chlorine reacts with water thus, $\text{Cl}_2 + \text{H}_2\text{O} \rightleftharpoons \text{HCl} + \text{HClO}$, and the final *E.M.F.* of the chlorine electrode is not reached until the equilibrium represented by this equation is established. The *E.M.F.* of the oxygen electrode increases gradually for days, finally reaching a value which probably corresponds with the establishment of the equilibrium $\text{H}_2\text{O} + \text{O} \rightleftharpoons \text{H}_2\text{O}_2$. The author considers that it is doubtful whether the peroxide formed is hydrogen peroxide, or an isomeric substance, or a higher peroxide. When the electrolyte used is sulphuric acid, a small quantity of persulphuric acid must also be produced, and this must be in equilibrium with the hydrogen peroxide and oxygen. T. E.

Experimental Contribution to the Theory of the Drop Electrode. By J. BERNSTEIN (*Zeit. physikal. Chem.*, 1901, 38, 200—204).—A cell containing two mercury electrodes (one being a drop electrode) was connected with a capillary electrometer. The movements of the meniscus in the electrometer and the formation and fall of the mercury drop in the cell were photographically recorded on the same plate. The current corresponding with the fall of each drop is thereby shown to be produced at the very moment of separation of the drop. The meniscus of the electrometer reached its point of maximum displacement 0.034 sec. after it began to move. The observation is interpreted according to Ostwald's (Abstr., 1888, 886) and Paschen's (Abstr., 1890, 552, 1036) views. J. C. P.

Nomenclature of the Ions. By JAMES WALKER (*Chem. News*, 1901, 84, 162—163).—A system of names is suggested for the material of the ions as distinguished from the particles themselves. For positive radicles, the termination 'ion' is added to the stem, and, where necessary, a Greek numeral is prefixed to indicate the valency of the metal: for example, hydrion (H^+), barion (Ba^{++}), monomercurion (Hg^+), triferion (Fe^{+++}). For negative radicles, the names are obtained by substituting '-anion,' '-osion,' '-idion,' for '-ate,' '-ite,' and '-ide' respectively; for example, hydroxidion (OH^-), sulphosion (SO_3^{--}), sulphanian (SO_4^{--}), carbanion (CO_3^{--}), chloridion (Cl^-). Terms such as 'chlorine ions' or 'chloridion molecules' should be used in speaking of the ions as particles, but 'chloridion' in speaking of the substance which constitutes them. J. C. P.

Influence of the addition of a Salt with one similar Ion on the E.M.F. of Electrolytic Cells. A Contribution to the Knowledge of the Behaviour of Strong Electrolytes. By OTTO SACKUR (*Zeit. physikal. Chem.*, 1901, 38, 129—162).—The equation given by Abegg and Bose (Abstr., 1900, ii, 127) for the influence of the addition of a salt with one similar ion on the *E.M.F.* of electrolytic cells has been arrived at thermodynamically by the author. In an experimental investigation of the subject, he has measured the *E.M.F.* of the cells



By adding the *E.M.F.* of these two cells, the potential difference, π_5 , is found, for $\pi_1 + \pi_3 + \pi_4 + \pi_6 = 0$, and π_2 is negligible, the rates of migration of the potassium and chlorine ions being almost equal. The values thus obtained for π_5 agree excellently with those calculated by the equation $\pi_5 = -RT/\epsilon(u-v)/(u+v) \cdot \log_e(k_1/k_2)$, where k_1 and k_2 are the conductivities of the lithium salt solutions. An excellent agreement with theory is also obtained when hydrochloric acid and nitric acid take the place of lithium chloride and lithium nitrate in this system.

On the basis of the law of mass action, with the help of the *E.M.F.* of the potassium salt cell described above and the conductivities of the two solutions, the degree of dissociation in the mixed potassium

chloride and nitrate solution has been calculated. The results lead to the conclusion either that the law of mass action is invalid for strong electrolytes, or that the ionic velocities alter with the concentration (compare Jahn, *Abstr.*, 1900, ii, 522, 707; this vol., ii, 299, 491). Conductivity measurements in mixed solutions show the inadequacy of Jahn's view that the deviations of strong electrolytes from the law of mass action are due to the increase with concentration of the ionic velocities (compare also Arrhenius, this vol., ii, 144, 435; Nernst, this vol., ii, 370; Lehfeldt, this vol., ii, 433; Sand, this vol., ii, 303).
J. C. P.

Electrolytic Reduction of Nitrites. By BER SULER (*Zeit. Elektrochem.*, 1901, 7, 831—842 and 847—855).—The analytical methods used for the determination of hydroxylamine, ammonia, and nitrite in presence of each other are fully described. Hydroxylamine is determined by boiling with Fehling's solution, the reaction being $2\text{NH}_2\cdot\text{OH} + 4\text{CuO} = \text{N}_2\text{O} + 2\text{Cu}_2\text{O} + 3\text{H}_2\text{O}$. Ammonia is determined by distillation in the usual way, copper sulphate being added to the alkaline liquid in order to destroy hydroxylamine. Nitrite is determined by distilling the solution with sodium hydroxide and ferrous sulphate, the nitrites and hydroxylamine being reduced by this treatment to ammonia.

In the electrolytic experiments, a solution of potassium nitrite was placed in a porous cell containing a cathode of zinc, the anode was of platinum immersed in a concentrated solution of sodium or potassium carbonate. The mean results obtained are as follows:

(a) Cathodic current density, 0.02 ampere per sq. cm. Temperature, 14—17°.

Concentration of cathode solution.	Current efficiency (per cent.).	
	$\text{NH}_2\cdot\text{OH}$.	NH_3 .
5 per cent.	54.3	32.5
10 "	21.0	54.2
15 "	6.6	75.5
25 "	2.0	75.4

(b) Temperature, 14—25°. Concentration, 5 per cent.

Current density at cathode.	Current efficiency (per cent.).	
	$\text{NH}_2\cdot\text{OH}$.	NH_3 .
0.02	54.3	32.5
0.05	33.1	13.8
0.1	27.6	10.3

(c) Concentration, 5 per cent. potassium nitrite; current density at cathode, 0.02 ampere per sq. cm.

Temperature.	Current efficiency (per cent.).	
	$\text{NH}_2\cdot\text{OH}$.	NH_3 .
0—2°	59.5—60	31—35
45—50	16.8—18.4	—
75—90	7.6—9.6	—

T. E.

[Electrochemical Reduction.] By FRITZ HABER (*J. pr. Chem.*, 1901, [ii], 64, 289—293).—Polemical: a reply to Binz (this vol., i, 593).
K. J. P. O.

Determination of the Constitution of Complex Salts by Electrolytic Transference. By E. RIEGER (*Zeit. Elektrochem.*, 1901, 7, 863—868 and 871—876).—The author has made determinations of the electrolytic transference of the ions of the following salts: potassium copper sulphate, potassium silver iodide, potassium mercuric iodide, potassium mercuric cyanide, potassium zinc cyanide, potassium cadmium cyanide, potassium ferrous and ferric oxalates. In all of them, the metal migrates towards the anode, although only partially in the case of the first-named salt. The presence of complex anions, indicated by this behaviour, is confirmed by the small conductivity of the solutions, which is always less than the sum of the conductivities of the constituents.
T. E.

Constitution of Inorganic Compounds. By ALFRED WERNER and CH. HERTY (*Zeit. physikal. Chem.*, 1901, 38, 331—352).—The authors uphold the views previously expressed (Abstr., 1897, ii, 100) against the objections raised by Petersen (Abstr., 1897, ii, 302). They maintain that the number of ions into which the metal-ammonia (and similar) compounds are dissociated can be ascertained from the electrical conductivity. The compounds examined by Petersen all undergo change when in contact with water, and the conductivities found by him are throughout too high. The electrical conductivities of several ethylenediamine-cobalt salts have been determined and compared with those of the corresponding ammonio-salts, and it has been found that by the substitution of ethylenediamine for ammonia the molecular conductivity is diminished. It was noticed that many of these compounds were considerably decomposed in the conductivity cell, and this was found to be due to the platinum sponge on the electrodes, which causes decomposition with evolution of gas and increase of molecular conductivity with the time. This has been observed with oxalotetramminocobalt bromine, dithiocyanodiethylenediamminocobalt nitrate, and the corresponding diisothiocyanosalt.

In the case of those salts with complex ions which suffer hydration in aqueous solution, the conductivity increases with the time. From the conductivity of the solution immediately after preparation, the number of ions into which it dissociates can be inferred, and the result so obtained can be confirmed by determination of the lowering of the freezing point. If the solution be kept at 0°, the conductivity remains constant for a considerable time. In this way, it is shown that the following salts dissociate, giving two ions: 1:6-dichlorodiethylenediamine-cobalt chloride (green), the same 1:2-salt (violet), and the corresponding nitrates.

The results obtained with the non-conducting salts are not in agreement with those found by Petersen. The fresh solutions have a very small conductivity, which increases with the time, but from the initial low value it is to be concluded that in the undecomposed state these salts do not dissociate. This has been experimentally proved for

cis- and *trans*-dichlorodiamminoplatinum (platosemidiamminochloride and platosamminochloride), *cis*-dichloropropylenediamminoplatinum, *cis*-dichloroethylenediamminoplatinum, and *cis*- and *trans*-tetrachlorodiamminoplatinum (platinisemidiamminochloride and platinamminochloride).

By determining the depression of the freezing point, it has been proved that hexamminocobalt chloride gives 4 ions, nitropentamminocobalt chloride gives 3 ions, nitroaquotetramminocobalt chloride gives 3 ions, and dinitrotetramminocobalt chloride gives 2 ions. J. McC.

Law of Physico-chemical Processes. By GILBERT N. LEWIS (*Zeit. physikal. Chem.*, 1901, 38, 205—226).—A thermodynamical paper, largely unsuitable for abstraction. The tendency of each particle of a phase to pass over into another phase (see this vol., ii, 10) is termed 'fugacity,' and the scope and bearing of the latter are fully dealt with. On the basis of thermodynamical laws, a general equation is deduced, involving the 'fugacity,' and embracing every possible change of state of a simple substance. J. C. P.

A Property of Monatomic Gases. By DANIEL BERTHELOT (*J. Physique*, 1901, 10, 611—614).—It follows directly from van der Waals' equation that at the critical temperature $8/3 P_c V_c = RT_c$. The equation, however, assumes incompressibility of the molecules themselves, and the ratio $RT_c/P_c V_c$ is in all cases hitherto examined greater than $8/3$, and higher for more complex than for simpler molecules. In the case of argon, a monatomic gas, $P_c = 52.8$ atmospheres, $T_c = 155.6^\circ$ (absolute), and although the critical density is not known, it may be calculated approximately, the value being probably between 0.434 and 0.448. From these values, the ratio $RT_c/P_c V_c = 2.62$ to 2.71 , a result in good accord with the theoretical value. L. M. J.

Reciprocal Salt Pairs. III. Melting Points of Reciprocal Salt Pairs; the Preparation for Analysis and the Synthesis of Minerals by Double Decomposition. By WILHELM MEYERHOFFER (*Zeit. physikal. Chem.*, 1901, 38, 307—325. Compare Abstr., 1896, ii, 414; 1899, ii, 410; 1900, ii, 198).—In the discussion of the melting point of reciprocal salt pairs, it is shown that both the stable and the metastable pairs can give either three congruent, or one congruent and one incongruent product, according as the salt pair remains unchanged, or deposits a third salt on fusion. If on melting no metastable condition occurs, the stable salt pair can be distinguished from the metastable pair by varying the proportions; in the case of congruent melting, the stable pair has only one melting point, but the metastable pair has three, according to the proportions, whilst in the case of incongruent melting, the stable pair has again only one melting point, but the metastable pair has two. These relationships are illustrated by the salt pair $\text{NaBr} + \text{KCl}$. A molecular mixture of these melts at a certain temperature (T_0) until the sodium bromide is completely fused; the temperature then rises until the saturation point of potassium chloride in fused sodium bromide is reached. Addition of sodium bromide or potassium chloride does not change the melting point, but causes more distinct or less distinct fusion at the temperature T_0 on account of the larger or smaller proportion of fused substance

to that which remains solid. On addition of one of the other salts, sodium chloride or potassium bromide, the melting point is lowered to T_1 or T_2 . A mixture of sodium chloride and potassium bromide in molecular proportion likewise melts at T_0 , because it is completely transformed into a mixture of sodium bromide and potassium chloride. On addition of sodium chloride or potassium bromide, the melting point is lowered to T_1 or T_2 , and addition of either of the other salts, sodium bromide or potassium chloride, causes no change of melting point. The stable salt pair ($\text{NaBr} + \text{KCl}$) has only one melting point (T_0), but the metastable pair ($\text{NaCl} + \text{KBr}$) has three (T_0 , T_1 , T_2), according to the proportion of each constituent.

Experiments on the fusion of mixtures of barium carbonate and potassium sulphate, and of barium sulphate and potassium carbonate prove that the former is the stable salt pair. The fused mixture deposits very little, if any, barium sulphate on cooling, but on treatment with water, reaction may take place so as to produce this. The amount of barium found in the residue as carbonate amounted to 90 to 95 per cent., no matter whether barium carbonate was fused with potassium sulphate, or barium sulphate with potassium carbonate, and the method was such as to give always too low results for this. The rate of cooling appears to have a slight influence on the amount of carbonate found.

The preparation of minerals for analysis, and the pyrochemical synthesis of minerals by double decomposition, are simply cases of converting a metastable salt pair into a stable pair. J. McC.

Observations on the Boiling Points of some Organic Liquids. By G. G. LONGINESCU (*Ann. Sci. Univ. Jassy*, 1901, 1, 359—371).—The additive property of the boiling point may be considered as due to the number of atoms in the molecule, and to the number of molecules in unit volume. Its constitutive character depends on the nature of the elements in the compound, the more or less complex arrangement of the molecules, and the arrangement of the atoms in the molecule. The author compares the ratio of the boiling points (absolute scale) of organic liquids with the ratio of the molecular weights and that of the densities. For compounds of carbon, hydrogen, and oxygen having the same number of atoms in the molecule, $T/T' = M/M'$ (T and M being the boiling point and molecular weight of the compounds). In these cases, therefore, the boiling point is proportional to the molecular weight.

Comparing the ratios for similar substances containing different numbers of atoms in the molecule, it is found that $T/T' = M/M'$. $\sqrt{n/n'}$ (n and n' being the number of atoms in the molecule).

A comparison of compounds, containing, besides carbon, hydrogen, and oxygen, also nitrogen, sulphur, silicon, boron, bismuth, or mercury, proves that the same regularities obtain.

Association of molecules may give rise to an abnormally high boiling point, for the liquid may be regarded as being composed of simple molecules in which double molecules are dissolved, and in this way the boiling point is raised. On this ground, the irregularities in the first terms of a series of alcohols, ethers, or esters can be accounted for. J. McC.

Vapour Tensions of Mixtures of Ether and Chloroform. By PH. KOHNSTAMM and B. M. VAN DALFSEN (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 4, 156—159). Compare Kohnstamm, this vol., ii, 145).—The vapour pressure curve of mixtures of ether and chloroform at 33·25° has a minimum close to the border, and seems to have also a point of inflexion. The results are at variance either with van der Waals' theory, or with the Galitzin-Berthelot rule.

J. C. P.

Vapour Pressures of Ternary Mixtures. By FRANS A. H. SCHREINEMAKERS (*Zeit. physikal. Chem.*, 1901, 38, 227—255).—A continuation of the author's previous work (this vol., ii, 146, 224, 305, 372, 436). In the present paper, the case of a ternary mixture with three possible liquid phases is treated theoretically; the system water—ether—succinonitrile fulfils these conditions, and has already been experimentally investigated by the author (*Abstr.*, 1898, ii, 329).

The influence of foreign substances on the vapour pressure or boiling point of binary mixtures (homogeneous and non-homogeneous) is also discussed (compare this vol., ii, 445). The addition of a third substance may raise or lower the boiling point of a homogeneous binary mixture according to the nature of its components; where, however, the mixture has itself a maximum or minimum boiling point, it behaves like a pure solvent.

J. C. P.

Calculation of the Heat of Volatilisation and Heat of Fusion of some Elements. By ROBERT DE FORCRAND (*Compt. rend.*, 1901, 133, 513—515).—From the general formula already referred to (this vol., ii, 594), the heat of volatilisation of certain elements can be calculated, although it has not yet been directly determined. The latent heat of vaporisation of phosphorus, for example, is 4200 cal. It follows that $P(\text{gas}) + 3H(\text{gas}) = PH_3(\text{gas})$ develops +9100 cal., and $2P(\text{gas}) + 5O(\text{gas}) = P_2O_5$ develops 372200 cal.

In the case of arsenic, the molecular weight is not so definitely known as in the case of phosphorus, but assuming the molecule at its boiling point to be As_4 , the heat of vaporisation is 5138 cal., and hence $As(\text{gas}) + 3H(\text{gas}) = AsH_3(\text{gas})$ develops -39060 cal.

In the case of selenium, assuming that the molecule is Se_2 at its boiling point, the latent heat of volatilisation is 14595 cal. $Se(\text{gas}) + 2H(\text{gas}) = SeH_2(\text{gas})$ develops -4805 cal., but if the constitution of the selenium molecule changes with the temperature, the heat of formation of the hydride may become positive.

C. H. B.

Thermochemistry of very Dilute Solutions. By H. von STEINWEHR (*Zeit. physikal. Chem.*, 1901, 38, 185—199).—The most delicate thermometers being useless in calorimetric work where the temperature change is of the order 0·01°, the author has worked out a differential method, involving the employment of thermo-couples. The reaction to be studied takes place in one of two glass vessels, isolated from each other, and protected from external variations of temperature. If the heat effect of the reaction is positive, the temperature of the solution in the other calorimeter is simultaneously raised by means of a glow lamp; if the heat effect is negative, the

glow lamp is put in the same vessel, so that there is practically no change of temperature. The glow lamp has been successfully employed as a means of supplying a definite quantity of energy. The method avoids disturbing temperature changes before and after the reaction, and permits the determination of temperature differences amounting to a few ten-thousandths of a degree and upwards. The heats of dilution of sulphuric and hydrochloric acids have been determined, also the heats of neutralisation of hydrochloric acid with sodium and barium hydroxides, the numbers obtained for the latter agreeing well with Thomsen's values. In particular, the author has determined the heats of dissociation for a number of electrolytes by adding a small quantity of a strong acid (hydrochloric) to a dilute solution of the sodium salt of a weak acid. This produces a certain quantity of undissociated weak acid, and the heat change, less the heat of dilution of the strong acid, is a measure of the heat of dissociation of the weak acid. Amongst others, the following heats of dissociation are recorded:—formic acid, -366 cal. at 13.1° ; acetic acid, -304 cal. at 17.5° ; dichloroacetic acid, $+1713$ cal. at 17.2° ; butyric acid, $+277$ cal. at 15.5° ; benzoic acid, -495 cal. at 13.5° ; salicylic acid, -1317 cal. at 13.45° ; hydrocyanic acid, -11100 cal. at 15° ; phenol, -5940 cal. at 14.6° ; hydrofluoric acid, $+3006$ cal. at 19.5° ; tartaric acid (first stage of dissociation), -863 cal. at 15° . Many of the values differ considerably from those given by Arrhenius. The variation of the heat of dissociation with temperature for butyric, benzoic, and salicylic acids as found by the author agrees with the results of Arrhenius and of Euler (compare Arrhenius, *Abstr.*, 1889, 1044; 1892, 931; Petersen, *Abstr.*, 1893, ii, 259; Euler, *Abstr.*, 1897, ii, 88). J. C. P.

Relations between Solubility and Heat of Solution. By ADOLFO CAMPETTI (*Atti Real. Accad. Lincei*, 1901, [v], 10, ii, 99—102).—From the relation arrived at by van't Hoff from a study of the influence of temperature on chemical equilibrium, namely, $q = -RT^2 (d\log_e K/dT)$, T being the absolute temperature, R the constant of the gas equation, K the equilibrium constant of the action considered, and q the amount of heat evolved by a gram-mol. of substance when no external work is done, the author derives the equation: $q = -4.58 (\log K_2 - \log K_1) T_1 T_2 / (T_2 - T_1)$, where K_1 and K_2 are the values of the equilibrium constant at the temperatures T_1 and T_2 . This equation can be applied to determine the quantity of heat evolved or absorbed by the solution of a substance in a solvent, when the concentrations c_1 and c_2 of the saturated solutions at T_1 and T_2 are known, K_1 and K_2 being then represented by c_1 and c_2 respectively. For this relation to hold, it is necessary that the dissolved substances shall not be dissociated, and the author has applied it to carbamide and to mannitol. The following table gives for carbamide the number of grams p which dissolve in 100 grams of water at t° , d being the density of the solution.

$t.$	$p.$	$d.$
9.85°	84.97	1.132
14.92	96.46	1.141
19.92	108.17	1.151

For the heat of solution, the mean values obtained were : $q = -3645$ cal. between 10° and 15° , and -3566 cal. between 15° and 20° , the corresponding numbers calculated from the formula being -2363 cal. between 10° and 15° , and -1752 cal. between 15° and 20° . If, instead of the true concentration, c be taken to represent the number of grams of substance present to every 100 of water in a saturated solution, the numbers agree better, being -4046 and -3833 cal. respectively.

In the case of mannitol, the numbers obtained were :

$t.$	$p.$	$d.$
10.00°	13.94	1.044
15.01	16.18	1.050
20.02	18.98	1.057

$q = -5004$ cal. between 10° and 15° , and -5012 cal. between 15° and 20° , the calculated values being -4380 cal. and -4731 cal. ; whilst if c represent grams of substance per 100 of water, $q = -4788$ cal. and -5342 cal. for the ranges of temperature $10-15^\circ$ and $15-20^\circ$ respectively.

Remembering that a small error in the ratio c_1/c_2 makes a relatively great difference in the value of q , it is seen that from the formula given the heat of solution can be calculated with fair approximation from the variation of solubility, c being taken to represent the number of grams of substance added to a constant weight of the solvent to give a saturated solution.

T. H. P.

Temperature Coefficient of the Susceptibility of some Salt Solutions of the Iron Group, particularly of Ferric Chloride. By HUGO MOSLER (*Ann. Phys.*, 1901, [iv], 6, 84-95).—The temperature coefficient of susceptibility has been determined by Wiedemann's method for solutions of ferric chloride and nitrate, cobalt nitrate, and manganese and nickel sulphates. In the case of ferric chloride there is a maximum value of the coefficient, corresponding with the concentration 33 per cent. The results in general agree well with those of Jäger and Meyer (*Sitzungsber. K. Akad. Wiss. Wien*, 1897, 106, 594).

J. C. P.

Remarkable Phenomena in the Neighbourhood of the Critical Point of partially Miscible Liquids. By JACOB FRIEDLÄNDER (*Zeit. physikal. Chem.*, 1901, 38, 385-440).—In the case of two partially miscible liquids, it is observed that just before complete homogeneity an opalescence is seen, and this phenomenon, together with the physical properties of the liquid solutions near the critical point, was investigated, chiefly in the case of isobutyric acid and water. The temperatures of complete miscibility for mixtures varying to the extent of about 9 per cent. on each side of the critical mixture were determined to about 0.01° . It was found that mixtures in the neighbourhood of the critical point exhibited no alteration of volume, conductivity, or internal friction on standing for 24 hours, they are hence in a stable condition, which is determined solely by temperature and composition. The opalescence also does not exhibit a time alteration, and in this respect differs from that produced in water by the addition of a solution of resin, when the opalescence decreases on standing. The internal friction was determined for various solutions at different

temperatures, and it was found that the temperature coefficient of the friction attained a maximum in the case of the liquid of the critical composition, this maximum being most marked near the critical temperature. Similar results were also obtained for other liquid mixtures, namely, phenol-water, and benzene-water-acetic acid. Analogous results were also found for the opalescence, which increases greatly as the liquid approaches the critical mixture. The coefficient of expansion, the conductivity, and the refractive index do not, however, show any marked variation when the critical state is approached, the refractive index being in good accord with that calculated additively. The author considers the cause of the opalescence to be, most probably, the separation of the liquid into minute drops, which differ, however, from ordinary suspensions, inasmuch as being of almost similar composition there is no distinct surface of separation.

L. M. J.

The Equation of Condition and the Theory of Cyclic Motion. By JOHANNES D. VAN DER WAALS (*Zeit. physikal. Chem.*, 1901, **38**, 257—288).—A mathematical paper, in which it is shown that a and b in the equation $(p + a/v^2)(v - b) = RT$, are constant for varying temperature and pressure only for monatomic gases. From Helmholtz's theory of cyclic motion, the variation of a and b with temperature and pressure for di- and poly-atomic molecules is deduced, and it is proved that the value of b varies with the pressure. The ratio of the specific heats, C_p/C_v , for diatomic molecules is 1.4, for triatomic molecules 1.2857.

J. McC.

Thermal Properties of isoPentane compared with those of Normal Pentane. By J. ROSE-INNES and SYDNEY YOUNG (*Phil. Mag.*, 1901, [vi], 2, 208—210. Compare Abstr., 1899, ii, 587).—If $RT - p_i v$ be 'the departure from Boyle's law' for isopentane, and $RT - p_n v$ that for normal pentane at the same temperature and volume, it is found that $RT - p_i v = \lambda(RT - p_n v)$, where λ is a constant. Thus, when $\lambda = 0.9463$ (according to the experimental data near the critical point of normal pentane), and when the values of $p_i v$, as calculated for the isothermals 280° , 240° , 200° , 160° , and 120° , from the data for normal pentane, are plotted against $v^{-\frac{1}{2}}$, the resulting curves agree very well with those obtained directly from experiment.

J. C. P.

Isobaric Aqueous Solutions. By J. A. GROSHANS (*Zeit. physikal. Chem.*, 1901, **38**, 163—174).—An application of the author's theory of 'density numbers' (Densitätszahlen). Isobaric solutions are obtained by taking two salts of the same 'density number,' and dissolving a molecule of each in equal quantities of water. According to the author, such solutions are of equal density.

J. C. P.

Specific Volume of Liquids at Infinite Pressure. By STEFANO PAGLIANI (*Atti Real. Accad. Lincei*, 1901, [v], 10, ii, 69—74).—From the equation of van der Waals, reduced to its simplest form for the case of a rarefied gas, Tumlirz (*Sitzungsber. K. Akad. Wiss. Wien*, 1900, 109, 837—848) deduced the relations:

$$(1) -1/v \cdot (\delta v / \delta p) T = 12.225m(v - a)^2 / Tv,$$

and

$$(2) (v_1 - v_n) = 12.225m(p_n - p_1)(v_1 - a) / T.(v_n - a),$$

v being the volume in c.c. of a kilogram of the gas, m its molecular weight, p the pressure in atmospheres, v_1 , v_n the specific volumes corresponding with the pressures p_1 and p_n , and a the constant of van der Waals' equation. Expression (1) gives the coefficient of compressibility of the liquid, whilst the constant a is obtained from (2). The values calculated from these equations for the compressibilities of a number of liquids do not show good agreement with the values experimentally obtained by several observers, and the author considers the deviations to be due to the fact that a varies with the temperature. The author has calculated the values of a at various temperatures for a number of liquids, and finds that in general it tends to increase as the temperature is raised, except in the case of ethyl ether, where a decrease occurs; with this ether, too, the ratio of the coefficient of compressibility at 100° to that at 0° is more than 3, whilst with the other liquids examined it is always below 2. In the following table, the values of a are given, together with n , the number of atoms in the molecule, and ma the product of mol. weight with the constant a :

	n .	a .	ma .
Mercury	1	0.00006798	0.013595
Water	3	0.00074573	0.013423
Carbon disulphide	3	0.00064052	0.048680
Ethyl alcohol	9	0.0009970	0.045862
Propyl „	12	0.0010199	0.061194
isoButyl „	15	0.0010429	0.077175
Amyl „	18	0.0010517	0.092550
Ethyl ether	15	0.0011025	0.081590
Benzene	12	0.0009593	0.074825
Toluene	15	0.0009865	0.090758
Xylene	18	0.0010061	0.106647
Cymene	24	0.0010240	0.137216

From these numbers, it is seen that, in general, the minimum specific volume a , assumed by a liquid under infinitely great pressure, increases with the complexity of the molecule. Further, the values of the product ma which are proportional to the molecular volumes, and hence also the values of $\sqrt[3]{ma}$, proportional to the diameters of the molecules, stand in relation with the molecular complexity.

T. H. P.

Relationship of Viscosity of Liquids to Temperature and Chemical Constitution. By ALEXIUS BATSCHINSKI (*Chem. Centr.*, 1901, ii, 450—451; from *Bull. Soc. Imp. Naturalistes Moscou*, 1901, 1—101).—The relationship of viscosity to temperature has been investigated for a large number of liquids. Bromine, nitric oxide, 10 aliphatic hydrocarbons, and 6 ethers behaved in accordance with the general law that the viscosity is inversely proportional to the cube of the absolute temperature. Of 30 halogen derivatives, 6 nitro-derivatives, 5 sulphur compounds, and 10 aldehydes and ketones, only 20, 1, 3, and 5 of each class respectively gave the calculated results. Abnormal data were also obtained in the case of anhydrides, acids, and alcohols, and of water below its boiling point. Thirteen aromatic compounds were

examined, but only 5 found to agree approximately with the law. Some esters behaved normally at the ordinary, but others only at a higher, temperature; 38 were examined. E. W. W.

Invisible Liquid Layers and Surface Tension of Liquid Precipitates in the case of Precipitated Membranes, Cells, Colloids, and Jellies. By GEORG QUINCKE (*Sitzungsber. K. Akad. Wiss. Berlin*, 1901, 858—874).—A detailed record of the phenomena observed when precipitates such as copper ferrocyanide and colloids such as silicic acid or ferric hydroxide separate from an aqueous solution. These phenomena are discussed especially in their relation to the surface tension between the two phases. J. C. P.

Experimental Determination of the Surface Tension of Liquid Air. By LEO GRUNMACH (*Sitzungsber. K. Akad. Wiss. Berlin*, 1901, 914—918).—By a method previously described (*Ann. Phys.*, 1900, [iv], 3, 660), the surface tension of samples of liquid air containing from 49.9 to 76.7 per cent. of oxygen is found to lie between 11.61 and 12.63 dyne/cm. [For the relative surface tensions of liquid hydrogen, liquid air, and water, compare Dewar, this vol., ii, 597.] J. C. P.

Diffusion of Hydrogen through Palladium. By ADOLF WINKELMANN (*Ann. Phys.*, 1901, [iv], 6, 104—115).—A palladium tube containing hydrogen and raised to a high temperature was connected with a manometer, and the process of diffusion followed by observing the fall of pressure. The quantity of gas which diffuses through the palladium does not diminish proportionally to the pressure. On the supposition (1) that the hydrogen dissociates, (2) that the quantity of gas diffusing is proportional to the pressure of the dissociated molecules, an expression is obtained which gives fairly accurately the relation between the pressure in the apparatus and the quantity of gas diffusing. It is therefore probable that the atoms of hydrogen, not the molecules, pass through palladium at high temperatures (compare Hoitsema, *Abstr.*, 1895, ii, 388). J. C. P.

The use of Reed Tubes for Dialysis. By P. PHILIPPSON (*Beitr. chem. Physiol. Path.*, 1901, 1, 80—82).—Certain tubular membranes of the reed *Phragmites communis* have been recommended for the filtration of bacterial cultures. They are composed of nearly pure cellulose, and lend themselves very well for the separation of colloids and crystalloids, especially when dealing with small quantities of material. Dialysis is stated to occur more rapidly than with parchment paper. W. D. H.

Chemical Equilibria. By OCTAVE BOUDOUARD (*Ann. Chim. Phys.*, 1901, [vii], 24, 5—85).—A *résumé* of earlier papers (compare *Abstr.*, 1899, ii, 287, 365, 417, 595, 596; 1900, ii, 199; this vol., ii, 383) containing a full discussion of the reversible action $2\text{CO} \rightleftharpoons \text{CO}_2 + \text{C}$ and its bearing on certain metallurgical processes. The presence of finely divided solids (amorphous carbon, pumice impregnated with metallic oxides, &c.) increases the velocity of the direct reaction without modi-

fixing the proportions of the gaseous reagents in the final system when equilibrium is attained. G. T. M.

Simultaneous Action of Hydrochloric Acid on Sucrose and Methyl Acetate. By VICTOR HENRI and LARGUIER DES BANCELS (*Compt. rend. Soc. Biol.*, 1901, 53, 784—786).—The velocities of the inversion of sucrose and of the hydrolysis of methyl acetate by hydrochloric acid were determined (1) when proceeding independently, (2) when proceeding simultaneously in the same solution. $N/5$ hydrochloric acid was used, the temperature was 29° , and the velocities were determined by the polarimeter and measurement of the acidity. The results showed (1) that the velocity of inversion of the sucrose was not affected by the presence of the methyl acetate; (2) the velocity of decomposition of the methyl acetate was slightly greater when sucrose was present. L. M. J.

[NOTE.—These results are not in accord with those of Coppadoro (this vol., ii, 544), who found the velocity of inversion of sucrose to be diminished by the presence of methyl acetate.—L.M.J.]

Polymolecular Chemical Transformations. By A. SCHÜKAREFF (*Zeit. physikal. Chem.*, 1901, 38, 353—368).—The speed of the reaction between a ferric salt (chromic acid, or nitrous acid) and an iodide was determined by ascertaining the time which elapsed between mixing these along with a known quantity of thiosulphate to which starch had been added, and the point when the mixture suddenly became blue. From determinations at different concentrations, the number of molecules which take part in the reaction could be calculated. The reaction between ferric salts and metallic iodides is unimolecular for the iron salt and bimolecular for the iodide. The number obtained for ferric chloride is 1.11, for sodium, potassium, calcium, and strontium iodides it is 1.7—1.8. For ferric sulphate, the number is always less than 1 (0.6, 0.8), a result which is possibly due to progressive hydrolysis of the salt. For calcium, strontium, and zinc iodides, the number is 1.7 when the reaction is with ferric chloride, and 2 when it is with ferric sulphate.

In the interaction of chromic acid and iodides, the acid takes part with one molecule. Strontium and calcium iodides act unimolecularly; for sodium iodide, the number is 1.2—1.3.

The reaction between nitrous acid and metallic iodides is polymolecular. The same number (1.6) of sodium iodide and calcium iodide molecules take part in the reaction.

The author believes that the results can be explained by assuming that the iodides are completely dissociated, and the reaction consists of the de-ionisation of the iodine ions. J. McC.

Theory of Solutions. By WALTHER NERNST (*Zeit. physikal. Chem.*, 1901, 38, 487—500).—A résumé of previously published mathematical deductions regarding solutions. An expression for the vapour pressure is first obtained, from which the values for the cryoscopic depression, solubility, electromotive force, and heat of dilution are obtained. A brief reply to Arrhenius (this vol., ii, 144) is added, in which it is pointed out that although he takes exception to the

assumption of the validity of the gaseous laws in solution, yet he himself tacitly makes the same assumption by the calculation of dissociation from the cryoscopic depressions.

L. M. J.

Physical Properties of Albuminous Micelles. By SWIGEL POSTERNAK (*Ann. Inst. Pasteur*, 1901, 15, 570—592).—A continuation of previous papers (this vol., ii, 231 and 544). The phenomena of the coagulation and the whole question of physical properties of proteids are discussed at length.

R. H. P.

Short Methods of Chemical Calculation. By JOSEPH W. RICHARDS (*Chem. Centr.*, 1901, ii, 724—725; from *J. Franklin Inst.*, 1901, 152, 109—112).—The volume of gas formed in any reaction may be calculated by expressing the relative weights of the substances taking part in kilograms, and assuming each molecule of gas liberated to occupy 22.22 cb.m. The weight of carbon, hydrogen, or oxygen contained in 1 cb.m. of any gas is equal to 0.54, 0.045 and 0.72 kilogram respectively, for each atom of the given element present in the molecule.

E. W. W.

A New Laboratory Barometer with Automatic Zero Adjustment. By BENEDIKT WORINGER (*Zeit. physikal. Chem.*, 1901, 38, 326—330).—The level of the mercury in the reservoir of the barometer is kept constant by inserting into the side of the containing vessel a tube of 1 to 2 mm. bore, bent down so that the point just touches the surface of the mercury. This tube is connected with a lower reservoir, from which mercury can be blown up into the higher one. On releasing the pressure, the mercury siphons back until, by the sinking of the level in the upper reservoir, the thread is broken. It is claimed that by this arrangement the level is adjusted to the same position by every operation to within 0.02 mm. A form of vernier for barometers and manometers is also described.

J. McC.

Inorganic Chemistry.

The Two Iodine Monochlorides. By GIUSEPPE ODDO (*Atti Real. Accad. Lincei*, 1901, [v], 10, ii, 54—58; *Gazzetta*, 1901, 31, ii, 146—151).—In order to determine the nature of the isomerism of the two iodine monochlorides, the author has studied their behaviour in freezing phosphorus oxychloride. The α -modification, which is obtained by the interaction of the calculated quantities of chlorine and iodine, or by distilling four parts of potassium chlorate with one part of iodine, and which crystallises, after melting, at 27.165°, gives a molecular weight corresponding with the formula ICl. Using this monochloride as solvent, with iodine as solute, the molecular freezing point depressions approach the theoretical value as the concentration

increases, whilst with solutions of tetrachloromethane the reverse is the case. All attempts to isolate the β -modification of iodine monochloride described by Stortenbeker (*Abstr.*, 1889, 102), who gave the melting point as 13.9° , were unsuccessful. In one experiment, the thermometer stood at 13.92° during the crystallisation of the product, but suddenly rose to 27.2° . This rapid transformation of the β - into the α -form makes it impossible to examine the cryoscopic behaviour of its solution. Since, however, the β -modification has a lower melting point than the α -form, its molecule must almost certainly have the simple formula.

T. H. P.

Iodine Trichloride. By GIUSEPPE ODDO (*Atti Real. Accad. Lincei*, 1901, [v], 10, ii, 116—121, and *Gazzetta*, 1901, 31, ii, 151—158).—In freezing phosphorus oxychloride, iodine trichloride gives the molecular weight 134.21—173.42, the calculated value being 233.2. The trichloride is hence dissociated into two parts, which the author considers to be the positive ion, ICl_2 , and the negative ion, Cl . In water, the molecular weight given by the cryoscopic method is 42.00—46.2.

T. H. P.

Active Oxygen obtained by Electrolysis. C. F. BOEHRINGER & SONS (D.R.-P. 117129).—The addition of a manganous salt to the dilute aqueous solution of an oxy-acid (for example, sulphuric acid) contained in the anode cell results in the formation of permanganic acid; this product readily oxidises substances introduced into the cell, and is reconverted into manganous salt. In this way, a small quantity of a manganese compound reacts catalytically in producing an indefinite amount of active oxygen. The agent readily oxidises sulphurous acid, and sulphuric acid having a sp. gr. 1.58 can be obtained in the electrolytic cell. A solution of manganous chloride, on electrolysis, readily yields chlorine and manganese dioxide.

Nitrotoluene, when placed at the anode of an electrolytic cell containing manganous sulphate dissolved in a mixture of dilute acetic and sulphuric acids, is readily oxidised to *p*-nitrobenzoic acid, the temperature being maintained at 80° during the operation. Aniline or quinol, dissolved in dilute sulphuric acid, is readily oxidised to quinone in the presence of manganous sulphate; in either case, the electrolytic cell is surrounded by a freezing mixture.

G. T. M.

Dissociation of the Sulphur Molecule, S_8 . By HEINRICH BILTZ (*Ber.*, 1901, 34, 2490—2495).—The density of sulphur vapour was determined at 440° , under pressures varying from 539.2 to 14 mm.; from 540 to 125 mm., the values agreed with those required for a molecular weight slightly greater than S_7 , but for smaller pressures there was a rapid and continuous diminution of density corresponding with a change from S_7 to S_4 . The curve given illustrating the change shows no break, and the author hence concludes that the dissociation from S_8 to S_2 with increasing temperature above the boiling point is simple, and is not accompanied by the intermediate formation of other aggregates such as S_6 or S_7 .

W. A. D.

Crystalline Form of Telluric Acid. By OTTO BRUNCK (*Ber.*, 1901, 34, 2735—2736).—Telluric acid, prepared by Staudenmaier's

method (Abstr., 1896, ii, 96), crystallises in long, white prisms belonging to the hexagonal system; measurements are given of the two chief angles. T. M. L.

[Sulphur Trioxide and its Dimeric Form.] By GIUSEPPE ODDO (*Gazzetta*, 1901, 31, ii, 158—170).—The author finds that in freezing phosphorus oxychloride solution, the liquid form of sulphur trioxide melting at $14\cdot8^\circ$ has the normal molecular weight whilst the other form, which decomposes without melting, has a molecular weight corresponding with that required for the formula S_2O_6 ; the latter compound is termed 'disulphuric anhydride.' Under the ordinary pressure, disulphuric anhydride begins to give off sulphur trioxide at about 50° . Sulphur trioxide is much more active chemically than the dimeric form. Thus, a drop of it immediately carbonises organic tissues, whilst in animals it produces profound ulceration; on the other hand, disulphuric anhydride is without action on such materials, provided it does not remain long enough to become hydrated. Sulphur trioxide reacts energetically with powdered camphor, but the dimeric form is without action for some time, after which vigorous action sets in, dissociation previously taking place. Sulphur trioxide does not react with any of the metals, not even with sodium or potassium, or with powdered metallic oxides; sodium oxide is acted on slightly, but the action is stopped by adding excess of the anhydride. Pieces of disulphuric anhydride remain unaltered for some days when placed at the bottom of an open test-tube, but sulphur trioxide, under the same conditions, is rapidly changed into its polymeride. T. H. P.

Borimide. By ALFRED STOCK and MARTIN BLIX (*Ber.*, 1901, 34, 3039—3047. Compare this vol., ii, 237).—The compound, $B_2S_3 \cdot BBr_3$, formed as a bye-product in the preparation of metathio-boric acid, or more readily by dissolving this acid in excess of boron bromide, is obtained in colourless crystals melting somewhat above 100° , and at higher temperatures decomposing into boron bromide and sulphide. The corresponding chloride, $B_2S_3 \cdot BCl_3$, is also obtained in colourless crystals. The compound $B_2S_3 \cdot 6NH_3$ is obtained in ill-defined, yellow crystals by dissolving the thio-acid in liquid ammonia and evaporating off the excess of this reagent at the ordinary summer temperature.

Borimide, $B_2(NH)_3$, results from the decomposition of the preceding compound at 115 — 120° , in accordance with the equation $B_2S_3 \cdot 6NH_3 = 3NH_4 \cdot SH + B_2(NH)_3$; the product retains traces of sulphur, and the operation is continued for some days in a rapid current of ammonia. The compound is finally obtained as a light, white powder, decomposed by water with development of heat into boric acid and ammonia. At 125 — 130° , borimide begins to evolve ammonia, and at higher temperatures it decomposes quantitatively into boron nitride and ammonia. Borimide is insoluble in all the indifferent solvents, but when shaken up with liquid ammonia it greatly increases in volume, yielding a gelatinous substance resembling aluminium hydroxide.

The *hydrochloride*, $B_2(NH)_3 \cdot 3HCl$, produced by shaking up the imide with liquid hydrogen chloride, is a white powder insoluble in all the ordinary organic solvents and decomposed by water; it is decomposed by heat into boron nitride, ammonium chloride, and hydrogen chloride.

The boron nitride, produced by the decomposition of borimide or its hydrochloride, is more reactive than the ordinary form of this compound; it is rapidly decomposed by hot water or by dilute sodium hydroxide and ammonia solutions. When ignited in the blowpipe, this reactive modification is converted into the ordinary variety, the change being probably due to polymerisation.

Although borimide is insoluble in liquid ammonia, it rapidly dissolves in this solvent on the addition of sulphur, yielding a dark blue solution. The coloured product is more stable than that obtained from sulphammonium and sulphur (compare Moissan, this vol., ii, 234), and is obtained after evaporating off the solvent as a deep blue, amorphous substance stable in dry air, and yielding blue solutions with water or absolute alcohol; it is immediately decomposed by acids with the separation of sulphur, and undergoes a slow decomposition in aqueous solution. This colour reaction is extremely delicate, and serves as a test for traces of free sulphur; a similar coloration was formerly observed on treating nitrogen sulphide containing traces of sulphur with a dilute alcoholic solution of potassium hydroxide; these effects may be due to the formation of analogous products. G. T. M.

Phenomena of Combustion in Furnaces. By OCTAVE BOUDOUARD (*Bull. Soc. Chim.*, 1901, [iii], 25, 833—840).—The results obtained in the study of the reaction $2\text{CO} \rightleftharpoons \text{CO}_2 + \text{C}$ (Abstr., 1899, ii, 417, 596; this vol., ii, 314, 646) are of importance in connection with the working of gas producers, blast-furnaces, and reverberatory furnaces. In the production of air-gas, it is shown that the temperature should be as near 1000° as is possible, the combustible substance in a finely-divided and porous state, and the velocity of the gas low. The fulfilment of similar conditions is necessary in the lower regions of blast-furnaces, and the height of the furnace and velocity of the gases must be so proportioned as to bring about the reduction of the ore without loss of carbon monoxide and consequent waste of fuel. When the mere fusion of metal is required, complete combustion with the minimum quantity of air is to be aimed at. The combustible should, therefore, present as small a surface as possible, the velocity of the gases should be high, in order to diminish the time of contact of the carbon dioxide with the fuel, and the products of combustion should be quickly cooled by a large charge of metal. N. L.

Carbon Oxysulphide. By WALTHER HEMPEL (*Zeit. angew. Chem.*, 1901, 14, 865—868. Compare Klason, Abstr., 1887, 1015).—As carbon oxysulphide is readily decomposed in the presence of moisture, it is best purified by liquefaction, and stored in the liquid state. The gas is passed through alkali (1 in 2), concentrated sulphuric acid, a mixture of triethylphosphine, pyridine, and nitrobenzene, and cooled, first by the aid of a freezing mixture of ice and salt to remove less volatile impurities, and then with solid carbon dioxide and ether to condense the oxysulphide. The pure compound has only a faint odour, but acts quickly on the nervous system. It boils at -47.5° under atmospheric pressure; its critical temperature is 105° , and the pressure 63 kilos. per sq. cm. One c.c. of water dissolves 0.8 c.c. of the compound at 13.5° and 756 mm., whereas 1 c.c. of a concentrated solution of cuprous

chloride in hydrochloric acid dissolves only 0.2 c.c. Mixtures of air and carbon oxysulphide are still explosive when they contain 11.9—28.5 per cent. of the gas.

In the analysis of gaseous mixtures containing carbon oxysulphide, hydrogen sulphide, and carbon dioxide, the hydrogen sulphide is first absorbed by acidified copper sulphate solution, the gas is then heated in a platinum capillary tube at 120° , when the oxysulphide is decomposed into sulphur and carbon monoxide; the latter is absorbed with acidified cuprous chloride, and then the carbon dioxide with alkali. J. J. S.

Metasilicic Acid. By VASILE C. BUTZUREANU (*Ann. Sci. Univ. Jassy*, 1901, 1, 319—320).—Precipitated gelatinous silicic acid is dehydrated by 90 per cent. alcohol and a white powder obtained which on ignition loses about 22 per cent. of water. The existence of metasilicic acid, $\text{SiO}(\text{OH})_2$, is thus proved. J. McC.

Purification of Cæsium Material. By HORACE L. WELLS (*Amer. Chem. J.*, 1901, 26, 265—268).—The author finds that the lead tetrachloride method of precipitating cæsium from its solutions (Abstr., 1893, ii, 521), although useful for removing small quantities of the metal, is inconvenient when large quantities are dealt with. He has therefore abandoned this method in favour of a modification of that of Godeffroy, in which the metal is precipitated as cæsium antimony chloride. When a high degree of purity is required, it is best obtained by means of the salt CsCl_2I (Wells and Penfield, Abstr., 1892, 773), from which pure cæsium chloride may be prepared by gentle ignition. E. G.

Cæsium-Tellurium Fluoride. By HORACE L. WELLS and J. M. WILLIS (*Amer. J. Sci.*, 1901, [iv], 12, 190).—The only cæsium-tellurium fluoride which it has been possible to obtain is CsF_2TeF_4 . It is prepared by adding cæsium fluoride to a hydrofluoric acid solution of tellurium fluoride, and crystallises in transparent, colourless needles which are decomposed by water. J. McC.

Acid Nitrates. By HORACE L. WELLS and F. J. METZGER (*Amer. Chem. J.*, 1901, 26, 271—275).—By saturating nitric acid of sp. gr. 1.42 with the normal nitrates of rubidium and cæsium at a gentle heat and cooling the solutions, the salts, $\text{RbNO}_3\cdot\text{HNO}_3$ and $\text{CsNO}_3\cdot\text{HNO}_3$, are readily prepared; by dissolving the normal nitrates in nitric acid of sp. gr. 1.50 and cooling with a freezing mixture, the salts, $\text{RbNO}_3\cdot 2\text{HNO}_3$, $\text{CsNO}_3\cdot 2\text{HNO}_3$, and $\text{TiNO}_3\cdot 2\text{HNO}_3$, are obtained. The salts, $2\text{RbNO}_3\cdot 5\text{HNO}_3$ and $\text{TiNO}_3\cdot 3\text{HNO}_3$, described by Ditte (Abstr., 1880, 153), could not be isolated. The mono-acid salts form large, flat masses of small, colourless, transparent crystals. The di-acid salts, $\text{RbNO}_3\cdot 2\text{HNO}_3$ and $\text{TiNO}_3\cdot 2\text{HNO}_3$, form colourless, transparent needles, whilst $\text{CsNO}_3\cdot 2\text{HNO}_3$ crystallises in large, thin, colourless, transparent plates. The salt $\text{RbNO}_3\cdot\text{HNO}_3$ melts at 62° , $\text{CsNO}_3\cdot\text{HNO}_3$ at 100° , $\text{RbNO}_3\cdot 2\text{HNO}_3$ at 39 — 46° , and $\text{CsNO}_3\cdot 2\text{HNO}_3$ at 32 — 36° . All the acid nitrates lose nitric acid more or less rapidly on exposure to the air. E. G.

Double Nitrates. By HORACE L. WELLS, H. P. BEARDSLEY, G. S. JAMIESON, and F. J. METZGER (*Amer. Chem. J.*, 1901, 26, 275—278).—*Cæsium ferric nitrate*, $\text{CsNO}_3 \cdot \text{Fe}(\text{NO}_3)_3 \cdot 7\text{H}_2\text{O}$, forms pale yellow, deliquescent, prismatic crystals and melts at 33—36°.

Cæsium bismuth nitrate, $2\text{CsNO}_3 \cdot \text{Bi}(\text{NO}_3)_3$, crystallises in long, colourless prisms and melts at 102°.

Thallous thallic nitrate, $2\text{TlNO}_3 \cdot \text{Tl}(\text{NO}_3)_3$, separates in large, colourless, transparent, prismatic crystals, and melts at 150°; it is stable in dry air, but blackens when exposed to moisture. E. G.

Cæsium Periodate and Iodate-Periodate. By HORACE L. WELLS (*Amer. Chem. J.*, 1901, 26, 278—281).—*Cæsium periodate*, CsIO_4 , obtained by dissolving the carbonate in concentrated solutions of periodic acid, crystallises in white plates, and dissolves sparingly in cold, but more readily in hot, water.

Cæsium hydrogen iodate-periodate, $\text{HCsIO}_3 \cdot \text{IO}_4 \cdot 2\text{H}_2\text{O}$, crystallises in slender, white prisms from a solution of cæsium periodate in dilute periodic acid, in which the periodate has suffered partial reduction; it may also be prepared by cooling a solution of cæsium iodate and periodate in dilute periodic acid. E. G.

Combination of Haloid Lithium Salts with Ammonia and Amines. By J. BONNEFOI (*Ann. Chim. Phys.*, 1901, [vii], 23, 317—378. Compare Abstr., 1897, ii, 371; 1899, i, 185, and ii, 96; 1900, ii, 130 and 478).—This communication contains a *résumé* of the study of the phenomenon of chemical dissociation as induced by changes of pressure and temperature, and the application of Clapeyron's formula to the verification of experimental results, particularly those obtained in investigating the compounds of metallic halogen salts with ammonia and the amines. The greater portion of the experimental data has already been published, but the following results are described for the first time. The compound $\text{LiCl} \cdot \text{NHMe}_2$, the sole product of the action of dimethylamine on lithium chloride, is a white, bulky substance, the molecular heat of dissolution of which is 9.242 Cal., its heat of formation from the gaseous amine and salt being 13.820 Cal. The heat of dissolution of the gaseous dimethylamine is 14.635 Cal. Trimethylamine, diethylamine, and triethylamine combine with lithium chloride in one proportion only, giving rise to compounds $\text{LiCl} \cdot \text{NMe}_3$, $\text{LiCl} \cdot \text{NHEt}_2$, and $\text{LiCl} \cdot \text{NEt}_3$, respectively; the heats of formation of these substances from the amine and the salt are, respectively, 13.774, 10.638, and 10.887 Cal., the heats of dissolution of the products being 7.603, 13.509, and 16.350 Cal. Lithium chloride combines with 1, 2, and 3 mols. of propylamine, butylamine, isobutylamine, amylamine, or hexylamine; it also interacts with aniline, forming $\text{LiCl} \cdot \text{NH}_2\text{Ph}$ and $\text{LiCl} \cdot 2\text{NH}_2\text{Ph}$. G. T. M.

[Non-]Existence of Ammonium. By OTTO RUFF (*Ber.*, 1901, 34, 2604—2607).—If a tube is taken shaped like an inverted Y, platinum electrodes are sealed into the bottom of the two lower limbs, these electrodes surrounded with potassium iodide in small lumps, liquid ammonia is placed over the whole, and a current passed while the apparatus is kept at -70° to -95° by a mixture of liquid air and alcohol, metallic potassium appears to be liberated at the cathode, and, rising into the

upper layers of the liquid ammonia, colours these blue. When ammonium iodide is used, no blue coloration is produced, even when the top limb of the tube is sealed up and the experiment allowed to continue until the tube bursts, which did not happen in one experiment until enough electricity had passed to generate hydrogen gas which must have produced a pressure of 60 atmospheres in the apparatus. It would seem that, even under these favourable circumstances, no metallic ammonium, analogous to metallic potassium, can have been produced. It may be doubted whether such a substance is capable of existence at all. Probably it is better to regard the group NH_4 rather as a compound $\text{H}\cdot\text{NH}_3$ which readily dissociates; it would then be analogous with the compounds of the alkali metals with ammonia, $\text{K}\cdot\text{NH}_3$, $\text{Na}\cdot\text{NH}_3$, $\text{Li}\cdot\text{NH}_3$. C. F. B.

Basic Energy of Silver Oxide in Solution. By M. G. LEVI (*Gazzetta*, 1901, 31, ii, 1—3).—Contrary to the generally quoted statement of Bineau that 1 part of silver oxide dissolves in 3000 of water, the author finds that at the ordinary temperature this amount of silver oxide requires 15,360 parts of water for its solution. The mean value of the dissociation constant, as determined by the electrical conductivity method for dilutions of 1783 to 14,264, is $100k = 0.0115$; the degree of dissociation for the former dilution is $m = 0.387$, and for the latter, 0.722. T. H. P.

Action of Hydrogen Peroxide on Silver Oxide. A Reply. By ADOLF VON BAEYER and VICTOR VILLIGER (*Ber.*, 1901, 34, 2769—2774. Compare this vol., ii, 315).—A reply to Berthelot (this vol., ii, 383). The authors have repeated their earlier experiments (*loc. cit.*) on the action of hydrogen peroxide on silver oxide, and have completely confirmed them and the conclusions drawn therefrom. In addition, Berthelot's experiment (*loc. cit.*) has been exactly repeated with every precaution, and it is found that the solid product of the interaction of hydrogen peroxide and silver oxide neither gives off oxygen when treated with sulphuric acid nor contains silver peroxide.

When aqueous sodium carbonate is added to a solution of hydrogen peroxide containing silver nitrate, a white precipitate of silver carbonate is formed, which immediately decomposes with the production of black flakes and a rapid evolution of gas; the latter, from the first, is a mixture of carbon dioxide and oxygen. K. J. P. O.

Sulphohaloids of Lead. By VICTOR LENHER (*J. Amer. Chem. Soc.*, 1901, 23, 680—682).—When lead sulphiodide is prepared by adding an aqueous solution of hydrogen sulphide to a solution of lead iodide in strong hydriodic acid, it has the same composition, $\text{PbS}\cdot 4\text{PbI}_2$, as that obtained by the method previously described (*Abstr.*, 1896, ii, 523). The sulphochloride, sulphobromide, and sulphiodide, may all be readily prepared by diluting a solution of lead sulphide in the corresponding strong halogen acid. The sulphofluoride could not be obtained. E. G.

Volatility of Lead Oxide. By M. STOERMER (*Chem. Zeit.*, 1901, 25, 818).—A series of experiments showing that during the cementation of lead oxide and silica a loss of lead oxide may occur to the

extent of 1.8—16.75 per cent., according to the quantity of oxide present. Once lead silicate is formed, there will be no further loss in lead on melting the mass, unless it should come into contact with reducing gases; a small portion of the oxide will then be reduced to metallic lead, which is still more volatile than the oxide. L. DE K.

Radio-active Lead. By KARL A. HOFMANN and EDUARD STRAUSS (*Ber.*, 1901, 34, 3033—3039. Compare this vol., ii, 19, 159, 385).—Further details are given as to the preparation and properties of radio-active lead salts. Uranium nitrate mother liquors have been used as a source of radio-active lead, and the separation of the latter from arsenic, copper, bismuth (polonium), and iron oxides, and calcium and barium (radium) carbonates is described. Stress is especially laid on the proof that no radium or polonium can be present in the lead salts obtained. The chromate of radio-active lead is not decomposed even on repeated warming with dilute sulphuric acid—a distinction from ordinary lead chromate. Whilst the sulphate alone acts on a photographic plate through aluminium or glass, especially after evaporation with nitric and sulphuric acids or heating for fifteen hours in an open vessel at 450°, all the radio-active lead salts are equally effective in discharging an electroscope. The photographic action of radio-active lead sulphate is greater than that of bismuth (polonium) oxychloride freshly prepared from pitchblende, and is approximately the same as that of the barium (radium) sulphate prepared from the same mineral. A polonium preparation, on the other hand, discharges an electroscope much more rapidly than a radio-active lead preparation. It thus appears that the radiation revealed by the photographic plate is not the same as that responsible for the dissipation of electrical charges.

J. C. P.

The Specific Volume as the Determining Criterion of Chemical Combination in Metal Alloys. By E. MAEY (*Zeit. physikal. Chem.*, 1901, 38, 292—306. Compare Abstr., 1899, ii, 547).—The author has examined the curve representing the change of specific volume with change of composition of a series of twenty-five alloys. In eight cases, it is found that this curve consists of straight lines, intersecting at points which indicate the existence of the compounds SnAg_3 , Au_2Bi_3 , BiPb (or Bi_2Pb_3), FeSb , SnCu_3 , and CuZn_2 . The author points out the utility of this method of examination, and shows that where the curve exhibits a break, there is definite indication of the existence of a compound, but compounds may exist and yet, on account of there being no sudden change of volume, there may be no break in the curve at the corresponding point.

J. McC.

New Determination of the Density of Copper-Tin, Copper-Zinc, and Tin-Zinc Alloys. By E. MAEY (*Zeit. physikal. Chem.*, 1901, 38, 289—291).—The densities of alloys of these metals in various proportions have been determined, and the results do not agree with the previous observations of Riche and Mallet. The following numbers indicate the densities of the alloys examined, poorest and richest in one metal: Copper-tin, 28 per cent. tin, sp. gr. 8.903 at 4°;

80 per cent. tin, sp. gr. 7.735 at 4°: Copper-zinc, 19.8 per cent. zinc, sp. gr. 8.459 at 4°; 94.1 per cent. zinc, sp. gr. 7.311 at 4°: Tin-zinc, 25 per cent. zinc, sp. gr. 7.233 at 4°; 75 per cent. zinc., sp. gr. = 7.110 at 4°.

J. McC.

Combined Action of Carbon Dioxide and Alkali Salts on Cupric Oxide. By OTTO KÜHLING (*Ber.*, 1901, 34, 2849—2852).—Freshly precipitated cupric oxide, suspended in a solution of sodium chloride in one case, and of sodium nitrate in the second, was treated with a stream of carbon dioxide during from two to five days. The bright green amorphous powders obtained had the constitutions represented respectively by the formulæ, $\text{OH}\cdot\text{CuCl}\cdot\text{CuCl}_2\cdot 5\text{Cu}(\text{OH})_2$, and $\text{OH}\cdot\text{Cu}\cdot\text{O}\cdot\text{CO}\cdot\text{O}\cdot\text{Cu}\cdot\text{OH}$.

R. H. P.

Action of Hydrogen on Mercury Sulphide. By H. PÉLABON (*Bull. Soc. Chim.*, 1901, [iii], 25, 777—785).—Details of work already published (this vol., ii, 545).

N. L.

Crystalline Metallic Compounds of Aluminium. By OTTO BRUNCK (*Ber.*, 1901, 34, 2733—2735).—The alloy Cu_4Al_9 is obtained in the form of long, white, glistening crystals by melting together equal weights of aluminium and copper, and pouring off the mother liquor as soon as crystallisation has begun; it has a sp. gr. 4.118, is not readily soluble in nitric acid, but dissolves easily in aqua regia; hydrochloric acid decomposes it, dissolving the aluminium, and leaving a residue of copper.

The alloy FeAl_3 is obtained in stout, iron-grey, glistening crystals by melting together 1 part of iron and 1 part of aluminium and extracting with 2 per cent. hydrochloric acid; the crystals have a sp. gr. 3.734, become bluish in air, and dissolve readily in strong acids.

The alloy NiAl_3 , prepared by a similar method to the iron compound, forms glistening, feathery crystals resembling nickel in colour, has a sp. gr. 3.681, and dissolves completely in strong acids.

The cobalt alloy, $\text{Co}_3\text{Al}_{13}$, differs in composition and in properties from the nickel compound; the fused mass consists of parallel lamellæ which, when etched, dissolve to feathery crystals which are coarser in structure and bluer in colour than the nickel compound.

The alloy Mn_2Al_7 forms tin-white, crystal plates and dissolves readily in strong hydrochloric acid.

The alloy $\text{Pt}_3\text{Al}_{10}$ forms stout, bronzy crystals of indistinct structure; hydrochloric acid dissolves out all the aluminium.

T. M. L.

Gradations in the Properties of Alums. By JAMES LOCKE (*Amer. Chem. J.*, 1901, 26, 166—185. Compare *Abstr.*, 1898, ii, 567).—The solubilities at 25° of 19 alums of the formula $\text{M}'\text{M}''(\text{SO}_4)_2\cdot 12\text{H}_2\text{O}$ were determined, and the results are given in gram-molecules per litre in the following table:

	K.	NH_4 .	Tl.	Rb.	Cs.
Al	0.28	0.387	0.177	0.059	0.013
V	—	1.210	0.573	0.177	0.0204
Cr	0.441	0.407	0.212	0.078	0.0151
Fe	—	1.659	0.799	0.293	0.045
In	—	—	—	—	0.172

An increase in the atomic weight of the tervalent metal produces a steady increase in the solubility of the alum, except in the case of chromium, which shows an abrupt decrease. The influence of the univalent metal is somewhat similar; the solubility decreases as the molecular weight increases in the series K, Rb, Cs, but the ammonium and thallium alums are abnormal, and (with one exception) are intermediate in solubility between the potassium and rubidium alums. The solubilities were also determined at intervals of 5° up to 40° in the case of 6 alums, and it was found that the more soluble alums had, in every case, the larger temperature coefficients.

In the case of 23 alums, the temperature was determined at which the crystals melt in their water of crystallisation. The results are given in the following table, those obtained by other observers being marked with an asterisk :

	Na.	K.	Tl.	NH ₄ .	Rb.	Cs.
Al	63°	91°	91°	95°	109°	122°
V	9*	20*	48	45	64	82
Cr	—	89	92	94	107	116
Fe	—	28	37	40	53	71
Co	—	—	—	—	47	63
In	—	—	—	36*	42	—

These figures correspond closely with the results of the solubility determinations, the melting point falling as the solubility increases; in the series Al, V, Fe, Co, the melting point falls as the atomic weight of the tervalent metal increases, whatever the nature of the univalent metal, but here again chromium shows an exceptional behaviour, and the melting points of the chromium alums are abnormally high.

T. M. L.

Indium. By CARL RENZ (*Ber.*, 1901, 34, 2763—2765).—Indium can be readily estimated by precipitating the hydroxide from hot solutions of indium salts by means of dimethylamine. After filtration, the hydroxide is separated as far as possible from the filter paper, ignited, and weighed as the sesquioxide.

Indium hydroxide behaves as a weak acid and forms indates. *Magnesium indate*, $\text{MgIn}_2\text{O}_4 \cdot 3\text{H}_2\text{O}$, prepared by boiling an aqueous solution of magnesium and indium chlorides, is a white, insoluble powder.

Indium molybdate, $\text{In}_2(\text{MoO}_4)_3 \cdot 2\text{H}_2\text{O}$, is formed as a voluminous precipitate when a solution of ammonium molybdate is added to solutions of indium salts, and can be used to separate indium and zinc.

Indium platinumocyanide, $\text{In}_2(\text{Pt}[\text{CN}]_4)_3 \cdot 2\text{H}_2\text{O}$ (?), is prepared by boiling solutions of indium sulphate and barium platinumocyanide, crystallises in white, hygroscopic leaflets, and in aqueous solution gives a characteristic blue precipitate with mercurous nitrate.

K. J. P. O.

Barium Manganate and Manganite. By GEORG KASSNER and H. KELLER (*Arch. Pharm.*, 1901, 239, 473—490).—(1) The preparation of potassium manganate by evaporating a solution of potassium permanganate and hydroxide and heating the residue at 300° in the absence of carbon dioxide, requires an amount of hydroxide equal to

$1\frac{1}{2}$ —2 times that corresponding with the equation $4\text{KMnO}_4 + 4\text{KOH} = 4\text{K}_2\text{MnO}_4 + 2\text{H}_2\text{O} + \text{O}_2$, in order to prevent the product from decomposing when it is dissolved. (2) The precipitated barium manganate contains, besides barium carbonate and oxides of manganese, some barium permanganate, which forms in the sample as it is kept. (3) Barium manganate does not contain any water of crystallisation or water chemically united. (4) Barium manganite is better formed by using hydrogen peroxide instead of potassium ferrocyanide to reduce the manganate, as the product is then free from iron, and decomposes less readily into barium oxide (or hydroxide) and manganese dioxide when it is washed. (5) Barium manganite appears to contain water of crystallisation corresponding with the formula $\text{BaMnO}_3 \cdot \text{H}_2\text{O}$. It contains, also, barium carbonate, oxides of manganese, and a residue insoluble in acids (barium silicate). C. F. B.

Preparation of [Potassium] Permanganate by means of Ozone. FARBENFABRIKEN VORM. F. BAYER & Co. (D.R.-P. 118232).—Potassium manganate in a strong alkaline solution is quantitatively converted into permanganate by the action of ozonised air at 40° in accordance with the equation $2\text{K}_2\text{MnO}_4 + \text{O} + \text{H}_2\text{O} = 2\text{KMnO}_4 + 2\text{KOH}$. The potassium permanganate crystallises out, and the potassium hydroxide is readily obtained on evaporation and employed in fusing further quantities of manganese dioxide. G. T. M.

Peroxides of Iron and the Catalytic Action of Iron Salts. By WILHELM MANCHOT and O. WILHELMS (*Ber.*, 1901, 34, 2479—2490).—In the liberation of iodine from potassium iodide by hydrogen peroxide in presence of a ferrous salt, the iron does not act catalytically, but is itself oxidised; for every ferrous atom present, 2 mols. of hydrogen peroxide are necessary and 2 atoms of iodine are liberated. Taking into account the oxygen used for oxidising the ferrous iron to ferric, the iodine liberated corresponds with the formation of a peroxide, Fe_2O_5 , or a periodide, FeI_5 .

On adding $\frac{1}{2}$ mol. of hydrogen peroxide to a solution of ferrous sulphate (1 mol.), the whole of the latter is rapidly oxidised to ferric sulphate, but on adding the ferrous salt (1 mol.) to the peroxide (0.5—1.4 mols.), both of these are found existing together, especially at 0° , in smaller or greater amount at the end of the operation (contrast Brode, this vol., ii, 443). Varying quantities of oxygen are evolved, and the mixtures give rather variable numbers on titrating back with permanganate. Using 1 mol. of ferrous salt and $1\frac{1}{2}$ mols. of hydrogen peroxide at 0° , the amount of the latter actually used, as found by this process, lies between 1 and $1\frac{1}{2}$ mols., corresponding as before with the formation of Fe_2O_5 .

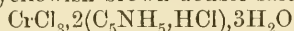
Ferric salts destroy hydrogen peroxide much more slowly than ferrous salts; it was found that ferrous ammonium sulphate destroyed more hydrogen peroxide in a given time than corresponded with oxidation to the ferric state, whilst under the same conditions ferric ammonium sulphate left a similar solution unaffected.

In acid solution, the interaction of iron salts, hydrogen peroxide, and potassium iodide is complex, the iodine being liberated more slowly; the iron here acts catalytically, and there is no well-defined

end point of the action. The addition of dilute sulphuric acid to a solution of hydrogen peroxide containing sufficient ferric ammonium sulphate to destroy the whole of the peroxide in about 70 hours practically prevented the iron from changing the strength of the solution. Acid also retards the oxidation of ferrous salts by hydrogen peroxide and the addition of oxygen (or hydrogen peroxide) to ferric salts.

W. A. D.

Existence of Trichlorotriaquochromium. By PAUL PFEIFFER (*Ber.*, 1901, 34, 2559—2564. Compare Werner and Gubser, this vol., ii, 453).—When the yellowish-brown double salt,



(pyridinium pentachlorochromate, *Abstr.*, 1900, i, 559), which dissolves readily in water, is stirred rapidly into an aqueous solution of silver nitrate cooled to 0°, and the stirring continued, the silver chloride settles completely and the liquid clears in about 10—15 seconds when the silver present is not equivalent to more than 2·1Cl in the molecule of the double salt; when it is equivalent to more, 25—110 seconds are required. From this, the conclusion is drawn that only 2 of the chlorine atoms are ionised, and that the double salt is to be regarded as a compound of trichlorotriaquochromium with pyridine hydrochloride; it would then have the formula $\text{CrCl}_3(\text{OH}_2)_3 \cdot 2(\text{C}_5\text{NH}_5\text{HCl})$, and would dissociate into $[\text{CrCl}_3(\text{OH}_2)_3]^+ + 2(\text{C}_5\text{NH}_5\text{H})^+$ and 2Cl^- . As the solution is yellowish-green when freshly prepared, this must be the colour of trichlorotriaquochromium, and as the colour of the solution gradually changes to the green colour characteristic of a solution of dichlorotetra-aquochromium chloride, $[\text{CrCl}_2(\text{OH}_2)_4]\text{Cl}$ or $[\text{CrCl}_2(\text{OH}_2)_4]^+ + \text{Cl}^-$, a molecular transformation must have taken place, 1 mol. of water being taken up.

It is also possible to suppose that the double salt has the constitution $[\text{CrCl}(\text{C}_5\text{NH}_5\text{HCl})_2(\text{OH}_2)_3]\text{Cl}$, which would dissociate into the ions $[\text{CrCl}(\text{C}_5\text{NH}_5\text{HCl})_2(\text{OH}_2)_3]^{++}$ and 2Cl^- , the more complex of which would then dissociate into $[\text{CrCl}_3(\text{OH}_2)_3]$ (trichlorotriaquochromium) and $2(\text{C}_5\text{NH}_5\text{H})^{++}$.

C. F. B.

Oxides, Sulphides, and Iodides of Molybdenum. By MARCEL GUICHARD (*Ann. Chim. Phys.*, 1901, [vii], 23, 498—574).—A detailed account of work already published (compare *Abstr.*, 1897, ii, 145, 496; 1900, ii, 80, 144, 211, 370, 658, and this vol., ii, 62, 242.)

G. T. M.

Specific Heats of Tungsten and Molybdenum. By EDOUARD DEFACQZ and MARCEL GUICHARD (*Ann. Chim. Phys.*, 1901, [vii], 24, 139—144).—The specific heat of a sample of tungsten containing 99·84 per cent. of the metal is 0·0340, 0·0366, and 0·0375 at 93°, 258°, and 423° respectively. The specific heat at any temperature, T , may be calculated from the equation

$$C_T = 10^{-10}(313903582 \cdot 57 + 516282 \cdot 0216T - 933 \cdot 0108T^2).$$

The specific heat of molybdenum (Mo = 99·78 per cent.) is 0·072, 0·074, and 0·072 at 93·25°, 281°, and 444° respectively; other intermediate values are also given. Regnault found that the specific heats of tungsten between 0° and 100° was 0·03636, whilst that of molybdenum at 100° was 0·07218.

G. T. M.

Uranyl Chloride and Water. By FRANZ MYLIUS and RUDOLF DIETZ (*Ber.*, 1901, 34, 2774—2778).—When a solution of uranic acid in concentrated hydrochloric acid is evaporated in a desiccator over sulphuric acid, a *compound*, $\text{UO}_2\text{Cl}_2 \cdot 3\text{H}_2\text{O}$, separates in yellowish-green, doubly-refracting, hygroscopic prisms, which on heating above 100° give off water, hydrogen chloride, and chlorine. The saturated aqueous solution (containing 76.2 per cent. UO_2Cl_2) is yellowish-green and viscous, and has a sp. gr. 2.74. On evaporation, hydrogen chloride is evolved and from the syrupy residue a *compound*, $\text{H}_4\text{UO}_5\text{Cl} \cdot 2\text{H}_2\text{O}$, separates in flattened needles; this loses its water of crystallisation at 150° and in aqueous solution scarcely reddens blue litmus. From the aqueous solution, silver oxide precipitates the whole of the chlorine, leaving a solution of “colloidal” uranic acid, which, however, immediately and entirely separates if heat is applied. The view is expressed that these substances are compounds of a uranyl hydrate and hydrogen chloride, namely, $\text{H}_4\text{UO}_5 \cdot 2\text{HCl}$ and $\text{H}_4\text{UO}_5 \cdot \text{HCl}$.

K. J. P. O.

Uranium Sulphate. By WILLIAM OECHSNER DE CONINCK (*Bull. Acad. Roy. Belg.*, 1901, 23, 349—351).—The densities of aqueous solutions (1—12 per cent.) of the salt $(\text{UO})_2\text{SO}_4 \cdot 3\text{H}_2\text{O}$ have been determined and also that of solutions (1—5 per cent.) in sulphuric acid of sp. gr. 1.168. The solubility of the salt in water at the ordinary temperature is about 5 parts in 100. The refractive indices of 8 and 10 per cent. aqueous solutions are 1.365 and 1.371 respectively.

R. H. P.

Double Chlorides of Cæsium and Thorium. By HORACE L. WELLS and J. M. WILLIS (*Amer. J. Sci.*, 1901, [iv], 12, 191—192).—As a rule, double halogen salts of quadrivalent metals belong to the type $2\text{M}^{\text{IV}}\text{Cl} \cdot \text{M}^{\text{IV}}\text{Cl}_4$. The double fluorides of zirconium (*Abstr.*, 1897, ii, 558) occur in a variety of types, and it was to be expected that thorium double haloids would also exist. Attempts to prepare a double fluoride of cæsium and thorium gave uncertain results, but two cæsium-thorium chlorides, $3\text{CsCl} \cdot \text{ThCl}_4 \cdot 12\text{H}_2\text{O}$ and $2\text{CsCl} \cdot \text{ThCl}_4 \cdot 11\text{H}_2\text{O}$, have been obtained. The first crystallises from solutions containing about 12 grams of thorium chloride and 30 to 110 grams of cæsium chloride; the second from solutions containing about 65 grams of thorium chloride and 30 to 100 grams of cæsium chloride. The salts are very hygroscopic and on account of the difficulty of drying them the amount of water of crystallisation is uncertain.

J. McC.

Double Salts of Antimony Pentachloride. By RUDOLPH F. WEINLAND and FR. SCHLEGELMILCH (*Ber.*, 1901, 34, 2633—2635).—Antimony pentachloride forms double salts with the chlorides of potassium, ammonium, calcium, and magnesium when a mixture of the two chlorides is dissolved in 15 per cent. hydrochloric acid and the solution cooled. The *potassium* salt, $\text{SbCl}_6\text{K} \cdot \text{SbCl}_5\text{K} \cdot \text{OH}$, forms irregular six-sided, hygroscopic plates. The *ammonium* salt, $\text{SbCl}_6(\text{NH}_4) \cdot \text{SbCl}_5 \cdot \text{NH}_4 \cdot \text{OH}$, crystallises in well-developed six-sided tablets and is not deliquescent.

The *calcium* salt, $\text{SbCl}_6 \cdot \text{Ca} \cdot \text{SbCl}_5 \cdot \text{OH}, 9\text{H}_2\text{O}$, crystallises well in long prisms and deliquesces in the air. The *magnesium* salt,
 $\text{SbCl}_7 \cdot \text{Mg}, \text{SbCl}_6 \cdot \text{Mg} \cdot \text{OH}, 17\text{H}_2\text{O}$,

is very hygroscopic and crystallises in long prisms or small plates. This property of antimony pentachloride corresponds with that of stannic chloride, the double salts of which are well known. A. H.

Salt of Quadrivalent Antimony. By HORACE L. WELLS and F. J. METZGER (*Amer. Chem. J.*, 1901, 26, 268—271).—The salt, Cs_2SbCl_6 , first obtained by Setterberg (*Öfver. K. Vetensk-Akad. Förhandl.*, 1882, 23) by boiling a solution of antimony trichloride in strong hydrochloric acid with antimony pentachloride and caesium chloride, crystallises in small, black octahedra, and when rubbed between the ground surfaces of a glass-stoppered bottle shows a dark blue colour. The author has also prepared a black double bromide which is probably the salt Cs_2SbBr_6 . E. G.

Nitrilopentachloro-osmates and the Constitution of Osmiamic Acid. By ALFRED WERNER and K. DINKLAGE (*Ber.*, 1901, 34, 2698—2703).—‘Osmiamic acid’ was discovered by Fritzsche and Struve (*J. pr. Chem.*, 1867, 41, 97) and named by them ‘osman-osmic acid’; its salts were shown by Joly (*Abstr.*, 1891, 1433) to have the formula OsNO_3R , and the constitution $\text{O}:\text{Os}(\cdot\text{OR})\cdot\text{N}:\text{O}$ was proposed for them. Their behaviour towards hydrochloric acid cannot be explained by this formula, and it is suggested that the acid is an imide of perosmic acid, $\text{O} \begin{array}{c} \diagup \text{O} \\ \diagdown \end{array} \text{Os} \begin{array}{c} \diagup \text{O} \\ \diagdown \end{array} \text{NH}$, whilst the salts may be derived from the tautomeric form, $\text{O} \begin{array}{c} \diagup \text{O} \\ \diagdown \end{array} \text{Os} \begin{array}{c} \diagup \text{OH} \\ \diagdown \end{array} \text{N}$.

Potassium nitrilopentachloro-osmate, $(\text{OsNCl}_5)\text{K}_2$, prepared by the action of cold hydrochloric acid on potassium osmiamate, is a reddish-brown, crystalline powder which readily dissolves in water with an intense cherry-red colour, and on slow evaporation separates from the solution in ruby-red prisms; it can be partially precipitated from solution by adding hydrochloric acid, decomposes gradually in dilute solution, and more rapidly when heated, and is insoluble in organic solvents. The *ammonium* salt, $(\text{OsNCl}_5)(\text{NH}_4)_2$, prepared by adding ammonium chloride to the liquors of the potassium salt, is a brown-violet crystalline powder, and resembles the potassium salt. The *rubidium* salt, $(\text{OsNCl}_5)\text{Rb}_2$, prepared in a similar way to the ammonium salt, resembles the potassium salt, but is less soluble, and decomposes very rapidly in dilute neutral solution. The *caesium* salt, $(\text{OsNCl}_5)\text{Cs}_2$, is prepared by a similar method, forms a grey powder with a reddish lustre, gives a red solution, but is still less soluble in water than the rubidium salt.

By the action of stannous chloride and hydrochloric acid on the osmiamates, Brizard (this vol., ii, 108) has obtained salts of the formula $(\text{OsCl}_5\text{NH}_2)\text{R}_2$, but their relationship with the series now described is not known. T. M. L.

Mineralogical Chemistry.

Crystalline Structure of Silver and Copper Nuggets. By ARCHIBALD LIVERSIDGE (*J. and Proc. Roy. Soc. New South Wales*, 1901, [1900], 34, 255—258).—The examinations were made by etching the polished sections as was previously done with gold and platinum nuggets (*Trans.*, 1897, 71, 1125). A silver nugget from Lake Superior with well-marked crystalline structure had the following composition (analysis by G. A. Waterhouse):

Ag.	Cu.	Au.	(Fe, Al) ₂ O ₃ .	Gangue.	Total.
97.39	0.07	trace	0.27	1.21	98.94

In the nuggets containing both silver and copper, from Lake Superior, the silver has been deposited on the copper.

As in the case of the gold and platinum nuggets, there is every indication of the silver and copper nuggets having been deposited from solution, and nothing to indicate that they have undergone fusion, either igneous or hydrothermal.

L. J. S.

Crystalline Structure of Gold Nuggets. By ARCHIBALD LIVERSIDGE (*J. and Proc. Roy. Soc. New South Wales*, 1901, [1900], 34, 259—262).—The examination of the crystalline structure of gold nuggets by etching polished sections, as explained in a previous paper (*Trans.*, 1897, 71, 1125), has been extended to specimens from other localities, namely, Victoria, New Zealand and Klondyke.

The structure and appearance of the Klondyke nuggets are quite distinct from those of gold from any other locality. They are very pale in colour, owing to the large amount of silver present. The assays of two gave only 64.550 and 64.622 per cent. of gold, and sp. gr. only 16.23.

L. J. S.

Texas Petroleum. By WILLIAM BATTLE PHILLIPS (*Bull. Univ. Texas*, No. 5 [*Univ. Texas Mineral Survey Bull.*, No. 1] 1901, 102 pp.).—A comprehensive account, including the results of several analyses, is given of the occurrence of petroleum in Texas.

L. J. S.

Petroleum in Fossiliferous Limestone from Baden. By CARL ENGLER and E. ALBRECHT (*Zeit. angew. Chem.*, 1901, 14, 913—916).—Three samples of yellow to brown thin liquid oil from cavities in fossil shells in Lias limestone at Roth-Malsch, in Baden, gave on analysis the following results: C, 86.59—87.66; H, 12.33—12.92 per cent.; traces of nitrogen and sulphur are also present. Asphalt, pitch, and solid paraffin were separated from the material. This oil is therefore identical with the mineral oil which occurs on a large scale in Nature, and it has probably been derived from the remains of marine organisms.

L. J. S.

Analyses of Pyrites. By VASILE C. BUTZUREANU (*Ann. Sci. Univ. Jassy*, 1901, 1, 309—312).—Analyses are given of four samples of massive and crystallised pyrites from Roumania.

L. J. S.

Telluride Ores of Cripple Creek and Kalgoorlie. By T. A. RICKARD (*Trans. Amer. Inst. Mining Eng.*, 1901, 30, 708—718).—The telluride ores and minerals of these two gold producing districts, in Colorado and Western Australia respectively, are compared. The following analyses by W. F. Grace are given of petzite from Kalgoorlie; it is iron-black, with sub-conchoidal fracture and sp. gr. 9.

Ag.	Au.	Te.	Hg.
40.47	24.64	34.60	0.29
40.55	24.62	34.83	0.00

The mercury is probably due to the presence of admixed coloradoite (HgTe), which resembles petzite in appearance and also occurs at Kalgoorlie. On these grounds, it is suggested that the mineral recently described (Abstr., 1898, ii, 385) under the name kalgoorlite (compare also coolgardite, this vol., ii, 515) is really a mixture of petzite and coloradoite.

L. J. S.

A New Cadmium Mineral. By E. WITTICH and B. NEUMANN (*Centr. Min.*, 1901, 549—551. Compare this vol., ii, 605).—The new mineral, cadmium oxide, CdO , occurs as a black, shining, crystalline encrustation and as powder on a mass of zinc ore with powdery iron oxide from Monte Ponì, Sardinia. Analysis of this zinc ore gave the following results:

ZnO.	SiO_2 .	Fe_2O_3 .	CaO.	MgO.	Cd.
60.59	31.3	5.5	1.7	1.6	Nil

The crystals of cadmium oxide are regular octahedra, sometimes with cube planes. $\text{H} = 3$: sp. gr. 6.146. Analysis gave Cd, 87.5; O, 12.5 per cent., corresponding with the values required by the formula CdO .

Black cubes of cadmium oxide of the same characters as the natural crystals were obtained artificially by burning cadmium in oxygen.

Zinc oxide being hexagonal and cadmium oxide cubic, it is probable that these substances are isodimorphous.

Small quantities of cadmium are of fairly wide distribution in zinc minerals, but the only cadmium mineral previously found is greenockite, CdS .

L. J. S.

[**Synchysite and Molybdophyllite.**] By GUSTAV FLINK (*Bull. Geol. Inst. Univ. Upsala*, 1901 [1900], 5, 81—96).—*Synchysite*.—This new name is applied to a mineral from Narsarsuk, in South Greenland, previously described under the name parisite (Abstr., 1895, ii, 401; 1900, ii, 410). The following new analysis, agreeing closely with that previously given, has been made by R. Mauzelius:

CO_2 .	ThO_2 .	Ce_2O_3 .	$(\text{La}, \text{Di})_2\text{O}_3$.	Y_2O_3 .	CaO.	FeO.
25.99	0.30	21.98	28.67	1.18	16.63	0.11
Total						
- F.						
- H_2O .						
less O for F.						
5.04						
2.10						
99.88						

The following are the main characters which distinguish the two minerals:

	Synchysite.	Parisite.
Chemical formula	$\text{CeFCa}(\text{CO}_3)_2$	$(\text{CeF})_2\text{Ca}(\text{CO}_3)_3$
Cleavage	Not original	Distinct basal
Sp. gr.	3.902	4.364
Refractive indices ...	$\left\{ \begin{array}{l} \omega \\ \epsilon \end{array} \right.$ 1.6742	1.569
	1.7701	1.670
Crystal system	Rhombohedral	Hexagonal

Molybdophyllite.—This new mineral is of rare occurrence with hausmannite in granular limestone or dolomite at Långbanshyttan, in Wermland, Sweden. It occurs as platy masses with a perfect cleavage in one direction, and has the appearance of mica. Thin plates are perfectly colourless and water-clear, though thicker masses are faintly greyish. It is optically uniaxial and negative. Etching experiments show that it belongs to the hexagonal system. Sp. gr. 4.717. $H = 3-4$. Analysis gives the formula $\text{R}_2\text{SiO}_4 \cdot \text{H}_2\text{O}$, showing it to be distinct from the somewhat similar Swedish mineral, barysilite ($3\text{PbO}, 2\text{SiO}_2$):

SiO_2 .	PbO.	MgO.	Al_2O_3 .	Na_2O .	K_2O .	H_2O .	Total.
18.15	61.09	11.71	0.46	0.82	0.69	6.32	99.24

L. J. S.

New Mineral Species found in Baveno Granite. By ETTORE ARTINI (*Atti Real. Accad. Lincei*, 1901, [v], 10, ii, 139—145).—A new mineral, *bavenite*, occurs on quartz and on orthoclase in the form of fibrous, radiating tufts of slender, white prisms or needles, the extremities being free and terminated by imperfect crystalline faces, and is accompanied by epidote, laumontite, and mica. The mineral, although apparently rhombic, is really monoclinic, each crystal being composed of two individuals twinned along $\{100\}$; $[a:b:c = 1.1751:1:0.7845]$; $\beta = 89^\circ 17' 19''$; it is readily melted by the blow-pipe, and is only slightly attacked by strong acids. Analysis gave:

SiO_2 .	Al_2O_3 .	CaO.	MgO.	Na_2O .	K_2O .	H_2O .	Total.
56.93	15.42	24.47	0.12	0.29	trace	2.49	99.72

These numbers correspond with those required for the formula $\text{Ca}_3\text{Al}_2\text{Si}_6\text{O}_{18} \cdot \text{H}_2\text{O}$.

T. H. P.

Dunite from Koswinsky-Kamen, Urals. By LOUIS DUPARC and FRANCIS PEARCE (*Compt. rend.*, 1901, 133, 476—478).—Several analyses are given of dunite, an olivine-rock occurring as veins penetrating koswite (this vol., ii, 398), and also as large masses in association with this.

L. J. S.

Organic Iodine in the Waters of Salsomaggiore. By C. MONTANARI (*L'Orosi*, 1901, 24, 223—225. Compare Nasini and Anderlini, *Abstr.*, 1900, ii, 489).—The small quantity of iodine in the waters of Salsomaggiore is wholly present in combination with organic matter. Such organic iodine the author considers may be of great importance therapeutically, as is the case with the iodine of the thyroid gland. The water also gives indications of the presence of organic nitrogen, but the quantity of water at the author's disposal was insufficient to allow him to be certain of this.

T. H. P.

Trafalgar Square Well Water. By WALTER W. FISHER (*Analyst*, 1901, 26, 204).—A recent analysis of this water, of which analyses in 1848 (Abel and Rowney, *Q. J. Chem. Soc.*, 1, 97) and 1857 (Campbell, *ibid.*, 9, 22) have been published in this Journal, shows that the composition has not changed substantially during the past forty-four years, but the amount of potassium salts is now much smaller than in the earliest samples. W. W. F.

Alkaline Waters from the Chalk. By WALTER W. FISHER (*Analyst*, 1901, 26, 202—208).—A correction of the earlier abstract (this vol., ii, 627). In view of the fact that alkaline waters are not only drawn from chalk beneath London Clay, but are obtained from other limestones, beneath Gault, Kimmeridge, Oxford, and Lias clays, the author believes that the alkali chlorides, sulphates, and carbonates are dissolved from the chalk itself and do not come from extraneous sources. Chalk obtained under London at depths of 500 and 800 feet contains distinct traces of sodium carbonate as well as chloride and sulphate. Owing to long-continued percolation, soluble salts have washed out from uncovered chalk but remain in the covered deposits where no natural drainage is possible. W. W. F.

Physiological Chemistry.

Minimum Quantity of Oxygen required by Fish ; Poisonous Quantities of Carbon Dioxide in the Water. By J. KUPZIS (*Zeit. Nahr.-Genussm.*, 1901, 4, 631—638).—A record of a large number of experiments with fish (red bream, groundling, whitefish, perch) to ascertain the smallest amount of oxygen required to keep them healthy, and also the influence of carbon dioxide on them. The results are tabulated.

It appears that when the amount of oxygen sinks to 1 c.c. per litre of water, the fish begin to show signs of being unwell, and that they perish when the amount is reduced to 0·8—0·5 c.c. As regards carbon dioxide, this only begins to affect the fish when present to the extent of 0·126 gram per litre, and 0·280 gram was required to kill the fish, except groundling. Carbon dioxide is therefore not likely to cause death to fish in aquaria, &c., as it will never accumulate in anything like these quantities. L. DE K.

Fat of Human Blood. By MAX ENGELHARDT (*Chem. Centr.*, 1901, ii, 490—491 ; from *Deutsch. Arch. klin. Med.*, 1901, 70, 182—189).—Estimations of fat in human blood were made by Nerking's method. The numbers obtained are smaller than those of previous observers ; in health, the percentage averages 0·194 ; in various cachectic conditions, 0·174. W. D. H.

Artificial Parthenogenesis. By WILLIAM J. GIES (*Amer. J. Physiol.*, 1901, 6, 53—76). By ALBERT P. MATHEWS (*ibid.*, 142—154).—The first paper deals with the question whether spermatozoa con-

tain an enzyme causing the development of mature ova. The experiments conducted with *Arbacia* led to a negative result. The second paper deals with star-fish eggs, and shows that the stimulus of mechanical agitation will produce the development of embryos. The agitation varied from merely transferring the eggs from one dish to another, to hard shaking in a test-tube. In all cases agitation led to a positive result. The best results were obtained by violent agitation, especially after the eggs had been in sea water for seven hours. The late gastrula stages were produced. W. D. H.

Influence of Food on the Secretion of Enzymes. By PORTIER and BIERRY (*Compt. rend. Soc. Biol.*, 1901, 53, 810—811).—Previous observers have shown that the secretion of enzymes adapts itself to the nature of the food given. The present experiments attempt to discover whether an animal which usually does not secrete a certain ferment will do so when fed on the food on which such a ferment acts. Thus the alimentary canal does not normally secrete inulase; dogs and rabbits were fed on Jerusalem artichokes but no inulase was found. Ducks do not normally secrete lactase; one duck was killed after a fifteen days' diet of lactose, but no lactase was found; another duck, killed ten days later, was found to have abundance of lactase in its intestine. W. D. H.

Salivary Digestion of Carbohydrates in the Stomach. By HENSAY (*Chem. Centr.*, 1901, ii, 698—699; from *Münch. med. Woch.*, 1901, 48, 1208—1210).—Great importance is attributed to the continuance of salivary digestion in the stomach. Direct observations on the stomach contents of healthy young adults show that the conversion of starch into maltose and soluble dextrins in the stomach is considerable. W. D. H.

Zymogens of the Stomach. By KARL GLAESSNER (*Beitr. chem. Physiol. Path.*, 1901, 1, 1—23, and 24—33).—The first paper describes experiments in which the varying solubilities and resistance to reagents is made use of to separate the zymogens of pepsin and of rennin from each other and from their respective enzymes.

The second paper deals with the distribution of the zymogens; that of rennin is found only at the fundus, and the parietal cells are suggested as its source. The amount of peptic ferment produced at the pyloric end of the stomach is very small; it is called pseudo-pepsin, and is active also in weakly alkaline solutions. W. D. H.

Peptic and Tryptic Digestion of Proteid. By D. LAWROFF (*Zeit. physiol. Chem.*, 1901, 33, 312—328).—The principal result of observations on the auto-digestion of the pig's stomach is that pepsin will, by prolonged action, break up proteids as much as trypsin does. Putrefaction was excluded. W. D. H.

Formation of Ammonia by the Action of Trypsin and Pepsin on Proteids. By S. DZIERZGOWSKI and SERGEI SALASKIN (*Chem. Centr.*, 1901, ii, 645—646; from *Centr. Physiol.*, 25, 249—254).—The quantity of ammonia liberated by the action of natural digestive

fluids on proteids has been determined by Nencki and Zaleski's method. Ammonia is formed by the tryptic as well as by the peptic digestion of fibrin, boiled egg-albumin, crystallised egg-albumin, and casein. The amount of ammonia varies with the different proteids, but in every case is greater than that liberated by digestion with dilute acid or alkali and less than that obtained when the albumins are completely decomposed by acids. The quantity of ammonia therefore never corresponds with the total amino-nitrogen of the proteid.

E. W. W.

Decomposition of Proteids by Trypsin. By JUNICHI MOCHIZUKI (*Beitr. chem. Physiol. Path.*, 1901, 1, 44—50).—If in a product of tryptic digestion the total nitrogen is taken as 100, 5·9 parts can be driven off by magnesia, 37·6 are contained in the precipitate produced by phosphotungstic acid, and the remainder is in the filtrate.

W. D. H.

Action of Proteolytic Enzymes on Toxins. By E. R. BALDWIN and P. A. LEVENE (*J. Med. Research*, 1901, 6, 120—134).—Diphtheria and tetanus toxins are digested, and not simply neutralised, by the three proteolytic enzymes, pepsin, trypsin, papain. They are thereby rendered inert. Tuberculin, which is looked on as a nucleo-proteid, is weakened in its action by the digestive ferments mentioned; prolonged digestion with trypsin, but not with pepsin, destroys its activity.

W. D. H.

Digestion in the Small Intestine. By FR. KUTSCHER and J. SEEMANN (*Chem. Centr.*, 1901, ii, 784; from *Centr. Physiol.*, 1901, 15, 275—276).—A dog was fed on meat, and the intestinal contents allowed to flow out of a fistula; these were boiled to prevent further tryptic action. The fluid gave no biuret reaction, but yielded leucine, tyrosine, and lysine.

W. D. H.

Influence of Urotropin on Intestinal Putrefaction. By WILHELM F. LÖBISCH (*Chem. Centr.*, 1901, ii, 705; from *Wien. med. Presse*, 1901).—Urotropin (hexamethylenetetramine) is a good antiseptic. It causes no bad symptoms, and greatly lessens intestinal putrefaction. The ethereal sulphates of the urine are greatly diminished. Under ordinary circumstances, indican is most abundant in the morning urine, and the other ethereal sulphates most abundant in the evening urine.

W. D. H.

Absorption in the Small and Large Intestines. By FELIX REACH (*Pflüger's Archiv*, 1901, 86, 247—258).—Absorption is less active in the large than in the small intestine. Gelatin solution is not so well absorbed as albumose solution in the large intestine; addition of 0·7 per cent. of sodium chloride increases the absorption of gelatin until it equals that of albumoses. The salt stimulates the mucous membrane and increases absorption generally.

In the small intestine, gelatin is a little better absorbed than albumose. Here, salt increases the absorption of albumose but not of gelatin.

Nutritive enemata should therefore be composed of peptonised food with the addition of gelatin and salt.
W. D. H.

Digestion and Metabolism in Echinoderms. By OTTO COHNHEIM (*Zeit. physiol. Chem.*, 1901, 33, 9—54).—Echinoderms (*Holothuria*, &c.) were selected as the objects of experiment, as it was hoped that in such simple animals the phenomena of absorption would be more easily solved than in vertebrates. The absorbed material passes into the body-cavity which represents the circulatory system of higher animals. Diffusion will explain the passage of most material into this fluid, except that an active 'water-transport' must depend on the physiological activity of the intestinal lining cells. The intestine produces a diastatic, an inverting, and, in some cases, a proteolytic ferment. The course of proteid metabolism is by no means clear. *Holothuria* secretes nitrogen only with the faeces. No ammonia is excreted. The production of carbon dioxide is small, and of this one-third leaves the body by the intestine. Small holothurians have a more vigorous metabolism than large ones.
W. D. H.

Alcohol and Proteid Metabolism. By RUDOLF ROSEMAN (*Pflüger's Archiv*, 1901, 86, 307—503).—A long discussion of the results of others. Some new experiments on man are given. The main result is that alcohol, within certain limits, is a proteid sparing food.
W. D. H.

Metabolism in the Pig during Feeding with Sugar, Starch, and Molasses. By EMERICH MEISSL and WILHELM BERSCH (*Chem. Centr.*, 1901, ii, 784—785; from *Zeit. landw. Versuchs-Wes. Oesterr.*, 1901, 4, 805—921).—The practical outcome of the investigation is the usefulness of molasses as a food for pigs. Full details of the experiments on metabolism in two animals are given. In a young animal, the putting on of flesh was increased, and of fat slightly diminished; in the older animal, this was reversed.
W. D. H.

Analogy between Loss of Water and Lowering of Temperature. By ARTHUR W. GREELEY (*Amer. J. Physiol.*, 1901, 6, 122—125).—In *Stentor*, a lowering of temperature produces certain morphological changes, which are the same as those produced by increasing the osmotic pressure of the surrounding medium. On raising the temperature again, the reverse process occurs. In *Spirogyra*, typical plasmolysis may be produced by reduction of the temperature. It is therefore probable that the main effect of lowering the temperature is to cause loss of water.
W. D. H.

Oxalic Acid in the Organism. By A. CIPOLLINA (*Chem. Centr.*, 1901, ii, 496; from *Berl. klin. Woch.*, 1901, 38, 544—547).—Human and animal organs contain only small quantities of oxalic acid; most is in the spleen. The total amount is about ten times as great as the daily amount in the urine. The spleen, and perhaps also the liver and muscles, are believed to oxidise uric acid with the formation of oxalic acid. Various foods contain larger amounts of the acid, which is stated to have injurious effects.
W. D. H.

Origin of Kynurenic Acid in the Organism. By KARL GLAESSNER and LEO LANGSTEIN (*Beitr. chem. Physiol. Path.*, 1901, 1, 34—43).—The experiments on dogs here recorded are considered to prove with certainty that kynurenic acid is a decomposition product of proteid produced during pancreatic digestion. W. D. H.

Reduction and Action of Aromatic Nitro-compounds [in the Animal Organism]. By KARL WALKO (*Chem. Centr.*, 1901, ii, 597; from *Arch. exp. Path. Pharm.*, 46, 181—196. Compare Rymsza, *Diss. Dorpat*, 1889, and Karplus, *Zeit. klin. Med.*, 22, 210).—When rabbits or dogs are injected with picric acid, by far the greater portion is excreted unchanged, but an amino-compound, a phenol, and a red dye are also found in the urine. The amino-compound is probably picramic acid, and may be detected by means of the azo-dye prepared by extracting with ether, diazotising, and treating with β -naphthol. The phenol is also soluble in ether and gives a brownish-black precipitate with ferric chloride. The red dye is present in far larger quantity than either of the preceding compounds, and is insoluble in ether. These substances do not necessarily result from any vital process in the organism, for they are formed when urine, especially that of dogs, is treated with picric acid, and allowed to remain until ammoniacal fermentation takes place, and also by the action of putrefying albumin, or of the alcoholic extract of dogs' or rabbits' liver on picric acid. Dinitrophenol, *o*-nitrophenol, nitrobenzoic acid, nitrosalicylic acid, nitrobenzaldehyde, nitroacetanilide, trinitronaphthol, nitrourethane, and dinitrohydroxyquinoline do not undergo any change in the animal organism.

The physiological action of picric acid, picramic acid, *o*-nitrophenol, 2:4-dinitrophenol, nitrosalicylic acid, nitrobenzoic acid, nitrobenzaldehyde, and nitrourethane is described in the original paper.

Under certain conditions, the paralysing action of strychnine on the peripheral nerves may become more pronounced, and in the case of the nitro-derivatives, dinitrostrychnine, and 'cacostrychnine,' this effect is predominant. Dinitrobrucine and 'cacotheline' also exert an action resembling that of curare. The nitro-derivative of thebaine, prepared by the action of nitric acid on thebaine at 60°, forms a pale yellow precipitate and has a physiological action different from that of thebaine itself. Nitroatropine and nitrosanguinarine have no effect on frogs. These results show that no common physiological action can be ascribed to nitro-compounds. E. W. W.

Syntheses in the Animal Organism. III. Oxidation Products of Citral in the Organism and some Cyclic Isomerides. By HERMANN HILDEBRANDT (*Chem. Centr.*, 1901, ii, 597—599; from *Arch. exp. Path. Pharm.*, 46, 261—273).—The mother liquor of the dibasic acid, $C_{10}H_{14}O_4$, found in the urine of rabbits after feeding with citral (this vol., ii, 180) is neither a glycuronic acid compound, since it is soluble in ether and does not reduce cupric oxide, nor geranic acid, $C_{10}H_{16}O_2$, for on digesting with a 65—70 per cent. solution of sulphuric acid it does not form α -cyclogeranic acid but yields, on the contrary, a dibasic acid, $C_{10}H_{14}O_4$. This acid separates in white,

crystalline masses, melts at 96° , is easily soluble in ether or hot light petroleum, but only slightly so in cold light petroleum and combines with 1 mol. of bromine. The original amorphous acid is probably a chain compound, and is converted by the action of the acid into a crystalline, cyclic isomeride. Since both these acids are also found in the urine after feeding with geranic acid, it must be assumed that citral is first oxidised to geranic acid in the organism. Attempts to convert the crystalline acid, $C_{10}H_{14}O_4$, melting at 187° , into a cyclic isomeride by the action of dilute acid failed, and similarly a cyclic isomeride of the crystalline acid obtained after administering α - and β -cyclogeranic acids could not be prepared. The cyclogeranic acids are, in fact, almost completely oxidised in the organism, and for the same reason cyclocitral and α - and β -geranic acids are much less poisonous than the corresponding chain compounds.

The mother liquor of the crystalline dibasic acid from which the oily isomeride has been removed, still contains the glycuronic acid compound of citral. By boiling this compound with dilute sulphuric acid and distilling in steam, a yellow oil is obtained. This oil is neither citral nor *p*-cymene, since when administered to rabbits neither the acid $C_{10}H_{14}O_4$ nor cumic acid, but a monobasic acid, $C_{10}H_{12}O_2$, is found in the urine. This acid crystallises from alcohol in long, slender needles, melts at 110° , is easily soluble in ether, and is not volatile in steam; it is not a derivative of cyclocitral, since it is not found in the urine after feeding with this substance. It is isomeric with cumic acid and hence probably the glycuronic acid compound of citral is related to *p*-cymene.

E. W. W.

First Appearance of Aldehydase in the Mammalian Embryo. By MARTIN JACOBY (*Zeit. physiol. Chem.*, 1901, 33, 128—130).—Previous observers have associated the oxidising ferments with nucleo-proteids, or with nuclear activity. It is, however, certainly the case that no oxydase, or at least no aldehydase, can be obtained from rapidly growing young mammalian embryos. In the pig embryo, it is not found until it attains the length of 9 cm. Possibly it may be present in the form of a zymogen at earlier dates.

W. D. H.

The Action of Serum-globulin on the Coagulation of Muscle Plasma. By KARL SPIRO (*Beitr. chem. Physiol. Path.*, 1901, 1, 78—79).—Serum-globulin possesses the power of hastening the coagulation of muscle plasma and the precipitation of its essential proteids. This, however, is the property of the eu-globulin fraction and not of the pseudo-globulin.

W. D. H.

Autolysis of the Lung. By MARTIN JACOBY (*Zeit. physiol. Chem.*, 1901, 33, 126—127).—Previous observers have noticed autolysis in various organs, liver, &c. The lungs of pigs were investigated to ascertain if a similar process occurs there. The products of proteid decomposition (leucine, tyrosine, &c.) were found in the lung tissue after removal from the body, bacterial action being excluded. Autolysis thus occurs in the lung and, indeed, may be regarded as an important physiological cell-function.

W. D. H.

Formation of Uric Acid in the Liver of Birds. By KATHARINA KOWALEWSKI and SERGEI SALASKIN (*Zeit. physiol. Chem.*, 1901, 33, 210--222).—The experiments described show that the liver takes a direct share in the formation of uric acid in birds, and, indeed, may be considered as the place where its synthesis occurs. The materials for its formation are not only ammonium lactate and ammonium salts of other organic acids, but may include such substances as arginine.

W. D. H.

[**Thyreo-globulin.**] By F. BLUM (*Zeit. physiol. Chem.*, 1901, 33, 345--346).—Polemical : a reply to A. Oswald (this vol., ii, 461).

J. J. S.

Stimulation and Paralysis of Nerve-cells and Nerve-endings. By JOHN W. LANGLEY (*J. Physiol.*, 1901, 27, 224--235).—The main action of nicotine in nerve-cells is that of stimulation, but differences are noted in different animals. It does not stimulate the nerve-endings of preganglionic fibres.

W. D. H.

Poisonous Effect of pure Sodium Chloride on Nerve-muscle Preparations. By HARVEY CUSHING (*Amer. J. Physiol.*, 1901, 6, 77--90).—Pure solutions of sodium chloride in increasing strengths produced an increasingly harmful effect on nerve-muscle preparations, This primarily affects the nerve-endings, and may be counteracted by 'physiologically balanced' salt solutions. An excess of calcium ions may produce an effect resembling *rigor mortis*.

W. D. H.

Human Colostrum. By HENRI LAJOUX (*J. Pharm. Chim.*, 1901, [vi], 14, 145--151, and 197--203).—The colostrum contains a larger proportion of nitrogenous substances than the milk, but the quantity rapidly diminishes ; it also contains less lactose and a greater proportion of mineral constituents. The amount of fat is variable but gradually increases. The total solids, fat, nitrogenous substances, lactose, ash, and the refractive index of the fat were determined on ten samples of colostrum, and the results are tabulated in the original ; these analyses indicate the variability in the duration of the colostrual period ; at the end of seven or eight days, the lacteal secretion of one subject had attained all the characters of milk, whilst that of another still possessed on the tenth day the viscosity and other properties of colostrum. The index of refraction of the fat diminishes as the time from parturition increases.

When the colostrum is treated with alcohol or excess of acetic acid, it yields a white, gelatinous, mucous substance, which, however, in exceptional cases, is deposited spontaneously. This precipitate is soluble in boiling dilute hydrochloric or sulphuric acid, with formation of an acid albumin and a substance which reduces Fehling's solution. The substance precipitated by alcohol is found to contain considerably less nitrogen than would be the case if it consisted only of albumin and casein. These facts show that the colostrum contains normally a true mucin, for which the author proposes the name *lactomucin*. E. G.

Iron in Human Milk. By ADOLF JOLLES and JOSEF K. FRIEDJUNG (*Chem. Centr.*, 1901, ii, 596 ; from *Arch. exp. Path. Pharm.*, 1901, 46, 247--260).—The average amount of iron in thirty specimens of human

milk is 5.09 mg. per litre. Non-hygienic conditions and ill-health cause a diminution. Ill-health of the child is a result, even when the mother is otherwise healthy. Various kinds of artificial human milk are also poor in iron.

W. D. H.

Composition of Cows' Milk in different stages of Milking. By P. HARDY (*Chem. Centr.*, 1901, ii, 645; from *Bull. Assoc. belge Chim.*, 1901, 15, 228—229).—In one experiment the first litre of milk drawn from the udder contained 3.5 per cent. of fat, the second, 3.75, the third, 3.8, the fourth, 4.2 per cent.; the solids rose from 11.85 to 12.25, the ash from 0.72 to 0.74 per cent. In another experiment, the result was 2.8, 4.15, 4.25, 5.1 per cent. of fat, 11.75—13.66 per cent. of solids, and 0.72—0.74 per cent. of ash. The milk of a third cow, which was collected half a litre at the time, showed 2.2, 2.9, 3.5, 3.75, 3.8, 3.9, 4.65 per cent. of fat, the solids rising from 10.52 to 12.70, and the ash from 0.74 to 0.75 per cent. The composition of the serum remains the same.

L. DE K.

The 'Skin' of Warmed Milk. By R. JAMISON and A. F. HERTZ (*J. Physiol.*, 1901, 27, 26—30).—The formation of a skin on warming is not characteristic of milk, but takes place in any proteid solution containing emulsified fat or paraffin. The film is formed of unchanged, dried proteid in the case of non-coagulable proteid, and in that of coagulable proteid if the temperature is kept below their coagulating point. If the temperature is higher, part of the proteid in the latter case is coagulated. The fat or paraffin globules are entangled in the film. Drying is an essential condition for the formation of the film.

W. D. H.

Oxidising Ferment contained in Pus. By DIOSCORIDE VITALI (*L'Orosi*, 1901, 24, 253—263).—The author finds that pus contains an oxidising enzyme which can be extracted by the action either of water or of not too concentrated acetic acid or of glycerol diluted with about half its volume of water, the pus being first triturated with glass until a homogeneous, pasty mass is obtained, the solvent then added, and after further trituration, the mass filtered. The filtered liquid thus prepared contains the oxydase, as it imparts an azure-blue colour to guaiacum resin. The action of the enzyme is destroyed by dilute hydrocyanic acid, chloroform, hydroxylamine, quinol, or pyrogallol, but is not influenced by aqueous phenol, thymol, or mercuric chloride. Like the vegetable oxydases, this enzyme contains a small proportion of manganese.

T. H. P.

Electrometric Determination of the Acidity of Urine. By LADISLAUS VON RHÖRER (*Pflüger's Archiv*, 1901, 86, 586—602).—*E.M.F.* determinations on the lines indicated by Bugarszky and Liebermann (*Abstr.*, 1898, i, 716) show that the concentration of H^+ ions in urine is about 30×10^{-7} . The author considers that they are primarily produced by the dissociation of the dihydrogen phosphates. The urine behaves like an acid which, in $N/30$ concentration, is dissociated to the extent of 1/100 per cent.

J. C. P.

Red Colouring Matter occurring in Urine after administration of Pyramidone. By MAX JAFFE (*Ber.*, 1901, 34, 2737—2741).—The

colouring matter is identical with Knorr's rubazonic acid,

$$\begin{array}{c} \text{NPh} \cdot \text{CO} \\ | \\ \text{N} = \text{CMe} \end{array} \text{CH} \cdot \text{N} : \text{C} \begin{array}{c} \text{CO} - \text{NPh} \\ | \\ \text{CMe} : \text{N} \end{array} \quad (\text{Abstr., 1887, 602}). \quad \text{T. M. L.}$$

Lecithin in Tuberculosis. By H. CLAUDE and ALY ZAKY (*Compt. rend.*, 1901, 133, 486—488; *Compt. rend. Soc. Biol.*, 1901, 53, 821—823).—Lecithin is stated to have a specific action on the elimination of phosphates in the urine, and a beneficial action on nitrogenous metabolism; it is therefore recommended as an adjuvant to other means of treating tuberculosis. W. D. H.

Influence of Lecithin on Urinary Constituents. By ALY ZAKY (*Compt. rend. Soc. Biol.*, 1901, 53, 830—832).—In man, lecithin produces, as in animals, an increase of total nitrogen, of urea, and of the coefficient of utilised nitrogen, and a diminution of the phosphoric acid, and usually of the uric acid in the urine. W. D. H.

Ricin Immunity. By MARTIN JACOBY (*Beitr. chem. Physiol. Path.*, 1901, 1, 51—77).—The toxin of ricin and the agglutinin go together; the immunising agent, antiricin, is here studied in a number of experiments conducted according to Ehrlich's views. The existence of ricin toxoids is established; these are removable by artificial gastric digestion. W. D. H.

Arsenic in the Organs of the Body. By C. HÖDLMOSE (Zeit. *physiol. Chem.*, 1901, 33, 329—344).—Gautier has stated that, normally, certain parts of the body (hair, thyroid, menstrual blood, &c.) contain arsenic (Abstr., 1900, ii, 152). These observations are not confirmed. Arsenic does not appear to be a normal constituent of the body. W. D. H.

Localisation and Dissemination of Antimony in the Animal Organism. By G. POUCHET (*Compt. rend.*, 1901, 133, 526—527).—When antimony in the form of tartar emetic is administered for a long time to rabbits and dogs by ingestion, it tends to accumulate in the digestive tract and is found only in very small quantities in the organs and other parts of the body. It therefore differs markedly from arsenic. If antimony is administered with small quantities of arsenic, the toxic effect of the latter seems to be increased, but the distribution of the two elements in the organism is not affected. C. H. B.

Physiological Action of Suprarenal Extract. By JOHN N. LANGLEY (*J. Physiol.*, 1901, 27, 237—256).—Suprarenal extract causes a brief but active secretion of the salivary and lacrimal glands. This is not affected by degeneration of the post-ganglionic fibres of the superior cervical ganglion, or by small doses of atropine, but after a large dose of atropine, there is no secretion caused by the extract. It has no certain effect on the secretion of sweat. It increases secretion of bile. It acts differently on different involuntary muscular organs, causing, for instance, inhibition of the bladder, stomach, gall bladder, &c., and contraction of the anal sphincters, uterus, and blood vessels. The theory that the extract acts on sympathetic nerve-endings breaks down in various instances. If its action is a direct

one on unstriated muscle, the difference must depend on intrinsic differences in the muscle which are at present unknown. W. D. H.

Comparative Investigations of the Pharmacological Actions of some Purine Derivatives. By OSWALD SCHMIEDEBERG (*Ber.*, 1901, 34, 2550—2559).—Experiments were made with frogs and rabbits; the drugs were dissolved in either water or sodium carbonate solution, and were administered either internally or by injection into the blood. The action of caffeine and theobromine is already known to be twofold. In the first place, they act on the central nervous system, producing an increased sensibility to external stimulus, developing into tetanus as the dose is increased, and culminating in paralysis when the dose is large. Secondly, they act on the muscles, facilitating the contraction of these at first, but producing muscular rigor when the dose is larger; the rigor may be local when the drug has been injected into the blood at a particular spot. Under the microscope, they are seen to coagulate the muscle-plasma. The relative degree of these two actions varies from substance to substance; with theobromine, the action on the muscles is greater in proportion to that on the nervous system than it is with caffeine. Parallel with the action on the muscles is a diuretic action, the two increasing together.

The nervous action depends on the presence of nitrogen in the molecule, for it is exhibited also by ammonia and ammonium salts. On the other hand, the muscular action is characteristic of the purine ring. Purine itself exhibits both actions. Introduction of oxygen or alkyl groups affects the degree of the two actions, both absolutely and relatively; no regularities could be observed in this respect, however. Such regularities as exist are probably masked by the fact that, owing to the difference in solubility and other causes, the rate at which the drug penetrates to the nerve cells and muscle fibres varies very much from case to case. Probably it is for some such reason that 7-oxypurine produces no muscular rigor and 2-oxypurine no tetanus, whereas with the 1:6-dimethyl derivative of the first and 1:3-dimethyl derivative of the second the missing action is manifested; the first two substances are insoluble in water and only slightly soluble in aqueous sodium carbonate, whereas the second two dissolve readily in water. The introduction of alkyloxy-groups produces a hypnotic or narcotic action, which may almost mask the tetanus. Several peculiarities were observed; for instance, 3:4:6-trimethylxanthine is only slightly active whilst 1:4:6-trimethylxanthine (caffeine) is much more so, and uric acid is not active, whilst its 1:3:4:6-tetramethyl derivative is.

Experiments were made with the following substances:—Purine 7-oxypurine (hypoxanthine), 1:6-dimethylhypoxanthine, 2-oxypurine, 1:3-dimethyl-2-oxypurine, 1:4:6-trimethyl-6:7-dihydro-5-oxypurine (deoxycaffeine), 5:7-dioxypurine (xanthine), 4-methylxanthine, 1-methylxanthine (heteroxanthine), 1:6-dimethylxanthine (theobromine), 4:6-dimethylxanthine (theophylline), 1:6-dimethylxanthine (paraxanthine), 3:4:6-trimethylxanthine, 1:4:6-trimethylxanthine (caffeine), 4-methyl-1:6-diethylxanthine, 1:2:4:6-tetramethylxanthine (2-methylcaffeine), 2:7-dioxypurine, 1:3-dimethyl-2:7-di-

oxypurine, 1 : 3 : 6-trimethyl-2 : 7-dioxypurine (*isocaffeine*), 2 : 5 : 7-trioxypurine (uric acid), and 1 : 3 : 4 : 6-tetramethyluric acid.

C. F. B.

Gelatin Fibres. By E. WAYMOUTH REID (*J. Physiol.*, 1901, 27, 161—173).—The experiments recorded lead to the conclusion that it is fallacious to take the filtrate of a physiological fluid through a gelatin membrane as identical with the original fluid in all respects except that of concentration of colloids. These membranes hold back some substances in ordinary solution, and the extent to which they are retained will have to be determined in each case by those who desire to use such filters for quantitative purposes.

W. D. H.

Chemistry of Vegetable Physiology and Agriculture.

Physiology of *Bacillus Pyocyaneus*. By OSCAR LOEW and YOSHINAI KOZAI (*Bull. Coll. Agr. Tokyo Imp. Univ.*, 1901, 4, 227—236).—As regards the nutrition of *B. pyocyaneus*, it was found that asparagine is more suitable than leucine, tyrosine, glycine, hydantoin, or creatine, and that acetates are better than tartrates. Acetates and glycerol promote the formation of mucus, but not to the same extent as broth.

In the production of the bacteriolytic enzyme, peptone was found to be the best nutrient; mucus is not formed to any extent. The presence of a little glycerol is beneficial, but increasing the amount of magnesium sulphate to 1 per cent. is without advantage.

N. H. J. M.

Biochemical Studies on the Tubercle Bacillus. By P. A. LEVENE (*J. Med. Research*, 1901, 6, 135—144).—Elementary analysis of the tubercle bacilli prepared on different media gave widely different results, especially in the amount of alcohol-ether extract. Differences were also observed in the amounts of proteid and of free nucleic acid present. By fractional heat-coagulation, the proteid material can be separated into three substances, each of which contains phosphorus. The nucleic acids separated vary much in composition; some of the preparations made are looked on as purer than the others. The only carbohydrate studied was one which closely resembles glycogen; this appears to be always present.

W. D. H.

Albumin-forming Bacteria. By GERLACH and VOGEL (*Centr. Bakt. Par.*, 1901, [ii], 7, 609—623).—Soil and stable manure contain several varieties of motile, non-spore-forming bacteria which are capable of converting the nitrogen of nitrates, nitrites, ammonium salts, and urea into insoluble proteids. Cultivated in a medium containing mineral salts, 0.5 per cent. of dextrose, and 0.3 per cent. of sodium nitrate, a certain amount of nitrite is formed, but after 5—10 days neither nitrate nor nitrite remains, whilst the total nitrogen

of the solution is unaltered, the whole of it being present in the insoluble proteids formed. No ammonia is produced. The nitrogen of ammonium salts is less readily assimilated and that of urea still less readily. In neither case is there any formation of nitrate or nitrite. When a solution containing urea is inoculated with these bacteria and with a species capable of converting urea into ammonium carbonate, a certain amount of the ammonia produced is utilised by the proteid-forming bacteria, but a considerable loss takes place by evaporation of the ammonia from the solution, so that the presence of proteid-forming bacteria in stable manure is not sufficient to prevent loss of ammonia in this way. In the presence of denitrifying organisms, practically the whole of the nitrogen of sodium nitrate is evolved as nitrogen, the denitrifying action proceeding much more rapidly than the conversion of the nitrogen of nitrates into proteid. When nitrate is added to garden soil containing some straw as a source of carbon, a similar action goes on; soil contains both denitrifying and proteid-forming organisms, and the result is not affected by inoculating with either or both species.

A. H.

Decomposition of Fodder and Food by Micro-organisms.
I. Organisms Destroying Fats. By JOSEF KÖNIG, ALB. SPIECKER-MANN, and W. BREMER (*Zeit. Nahr.-Genussm.*, 1901, 4, 721—744 and 769—780).—A chemical and bacteriological investigation of the changes undergone by cottonseed-meal when decomposed by micro-organisms. Three samples of meal each contained moulds and bacteria; the moulds only grew when the meal contained more than 14 per cent. of moisture. The growth of the moulds was accompanied by a decomposition of the fats and the nitrogen-free extractives. The bacteria, on the other hand, had a stronger action on the proteids. Experiments with pure cultures showed that the moulds decompose, not only fats, but also fatty acids, both being apparently converted directly into water and carbon dioxide.

R. H. P.

Monilia Sitophila, a Technical Mould from Java. By F. A. F. C. WENT (*Centr. Bakt. Par.*, 1901, [ii], 7, 544—550 and 591—598. Compare this vol., ii, 411).—This mould brings about hydrolysis of fats, peptonisation and further decomposition of proteids and amyolysis, and penetrates the walls of vegetable cells, breaking up the cellulose. The best single medium for its cultivation is peptone. In presence of ammonium nitrate, as a source of nitrogen, it can derive its carbon from raffinose, maltose, dextrose, starch, commercial levulose, as well as in a less degree from many other carbohydrates and allied compounds. In a similar manner, when the source of carbon is dextrose, the best source of nitrogen is found to be peptone or tyrosine. Glycerol, by itself, is only very slowly assimilated, but when both glycerol and raffinose are employed, the yield is far greater than when raffinose alone is present. It seems probable that the glycerol is oxidised, whilst the raffinose is assimilated for the purpose of mycelium formation. The mould only develops sparingly under anaërobic conditions, forming alcohol and esters, the nature of which could not be determined.

A. H.

Agglutination of Yeast. By H. P. BARENDRECHT (*Centr. Bakt. Par.*, 1901, [ii], 7, 623—627).—Some varieties of yeast are rapidly agglutinated in the presence of acids. The optimum concentration of acid varies slightly, but corresponds on the average with $N/300$ sulphuric acid. The action appears to be a function of the concentration of the hydrogen ions, since weak acids, such as acetic acid, must be present in larger amount, and their action is much diminished by the presence of a salt of the same acid. When the amount of acid is increased beyond the optimum, the agglutination takes place more slowly and less perfectly. Different varieties of yeast show considerable differences in the ease with which they are agglutinated, and the nature of the medium in which they have been cultivated also modifies the result, ammonium salts being favourable to the occurrence of agglutination. The agglutination which sometimes occurs in the manufacture of pressed yeast is not due to this cause, but is produced by the viscous substances formed from sucrose by an organism (*Leuconostoc agglutinans*) which is always found in such samples. A. H.

Experiments with Yeast Cells in Concentrated Saline Solutions. By CHARLES CLERFEY (Bull. Acad. Roy. Belg., 1901, 23, 337—348).—Yeast cells can be accustomed to grow in concentrated saline solutions; those accustomed to any one particular salt will grow at a slower rate than ordinary yeast cells in a solution of another salt. In these experiments, the electropositive ion had the greater influence. R. H. P.

[Proteolytic Enzyme from Yeast.] A Reply to Kutscher. By MARTIN HAHN and L. GERET (*Zeit. physiol. Chem.*, 1901, 33, 385—389. Compare this vol., ii, 466, 523).—The different results obtained by the authors and by Kutscher may be due to the fact that they themselves used filtered solutions of enzymes free from cells, whereas Kutscher used the enzyme in the presence of dead cells. The proteolytic enzyme of yeast—yeast tryp-in of Kutscher, yeast endotrypsin of the authors—differs essentially from pancreatic trypsin in the fact that it becomes much less active in the presence of acid. J. J. S.

Distribution of Acidity in Stems, Leaves, and Flowers. By A. ASTRUC (*Compt. rend.*, 1901, 133, 491—493).—The study of the acidity of plants, which was hitherto confined chiefly to oil-yielding plants, has been extended by the author to a large number of widely different families.

It was found that the acidity of the stems diminishes with the distance from the top of the stem, and that the acidity of the leaves especially the growing zone, is greater than that of the stems. In the case of flowers, the acidity diminishes as development proceeds.

The most recent growth always shows the greatest acidity, and there is a close relation between the production of acids on the one hand and of intensity of growth on the other. N. H. J. M.

Formation of Acids in Plants. By MARCELLIN P. E. BERTHELOT and GEORGES ANDRÉ (*Compt. rend.*, 1901, 133, 502—504).—The total equivalent of the acids present in a plant can only be ascertained by

determining the alkalinity of the ash of the plant, and adding the value thus found to the acidity of the juice of the plant as determined directly by titration.

C. H. B.

Occurrence of Organic Iron Compounds in Plants. By U. SUZUKI (*Bull. Coll. Agr. Tokyo Imp. Univ.*, 1901, 4, 260—266).—The seeds and leaves of *Polygonum tinctorium* (1 a and b) and of *Indigofera tinctoria* (2 a and b) were found to contain 2.84, 15.5, 4.0, and 4.3 per cent. of crude ash respectively of the following composition:

		K ₂ O.	Na ₂ O.	CaO.	MgO.	Fe ₂ O ₃ .	P ₂ O ₅ .	SO ₃ .	SiO ₂ .
1	a.	21.5	2.4	5.1	15.2	12.1	41.1	4.10	0.35
	b.	21.40	6.0	39.1	12.30	3.11	4.13	4.77	1.75
2	a.	18.7	4.2	11.0	9.9	12.0	34.2	2.4	3.1
	b.	17.80	2.0	37.0	6.4	4.8	3.50	3.80	6.25

The ethereal, alcoholic, and aqueous extracts of the dried leaves and seeds were found to be free from iron. Solutions of sodium chloride extracted only traces of iron or none at all. The greater portion of the iron (60—70 per cent.) is present in a nuclein-like substance which is precipitated by dilute acetic acid from extracts with dilute alkali; the precipitate contains N 10.4 and Fe 0.5 per cent. When subjected to artificial pepsin digestion, a portion of the proteid dissolved, and on precipitating the solution with alcohol, the products still contained iron. The residue, insoluble in pepsin, contains N 5—10 and Fe 0.5—1.0 per cent.

The iron compound differs from hæmatogen in being partially dissolved by artificial pepsin digestion; both the dissolved and undissolved portions liberate small quantities of iron when treated with 0.2 per cent. hydrochloric acid. It is also much more sparingly soluble in dilute ammonia than hæmatogen.

N. H. J. M.

Chemical Changes in Apples during Ripening. By RICHARD OTTO (*Chem. Centr.*, 1901, ii, 553; from *Proskauer Obstbau-Zeit.*, 1901, July).—The following changes have been found to take place in apples when allowed to ripen on the tree or when stored. The amounts of water and ash of the dry substance decrease as the fruit matures, whilst, on the other hand, the quantity of dry substance increases. Unripe apples contain a maximum of about 4 per cent. of starch which at first only slowly, but afterwards more rapidly, decreases until it disappears entirely in the ripe fruit. The amount of cellulose does not change during the initial stages of maturing, and the content of sucrose is also not affected by ripening but decreases on prolonged storing. The nitrogenous substances attain a maximum in the ripe apple but decrease on storing. The sp. gr. of apple must increases on keeping, whilst the total acids calculated as malic acid and the small quantity of pectic acid decrease. The quantity of sugar estimated by Öchsle's method is on the average 0.7—0.9 per cent. less than that of the total sugar, dextrose, and extract determined by Allihn's method; the data obtained by both methods show a constant increase during the storing of the must.

E. W. W.

Bark of Robinia Pseudacacia. By FREDERICK B. POWER (*Pharm. J.*, 1901, [iv], 13, 258—261, and 275—279).—The author has shown (*Pharm. Rundschau*, 1890, 29—38) that the bark of *Robinia Pseudacacia* contains a toxic proteid, for which he now proposes the name *robin*. This substance has an acid reaction, is soluble in water and salt solutions, and is reprecipitated by acids; it is coagulated by heat with complete loss of its poisonous properties. It gives the usual colour reactions of proteids, and yields about 4 per cent. of ash which contains a considerable amount of iron. It also possesses the properties of an enzyme, effecting the hydrolysis of both amygdalin and potassium myronate. It is capable of coagulating the casein of milk, and of agglutinating the red blood corpuscles of certain animals.

The bark also contains one or more substances of an alkaloidal nature which could not be isolated owing to their decomposition, with formation of ammonia and small quantities of an amine. When an extract of the bark is boiled with hydrochloric acid, syringic acid and dextrose are produced, together with a red, amorphous substance which is probably syringenin. Tannic acid, some amorphous colouring matter, fat, and resin are also found in the bark.

The leaves of the plant appear to contain neither a soluble proteid nor an alkaloid. E. G.

Physiological Significance of Colchicine in different varieties of Colchicum and Merendera. By GIACOMO ALBO (*Arch. Sci. Phys. Nat. Genève*, 1901, [iv], 12, 227—236).—Colchicine was found to occur, not only in *Colchicum autumnale*, but also in *C. laetum*, *C. variegatum*, *C. Bisignani*, *C. Cupani*, *C. veratrifolium*, *C. Bivonae*, *C. persicum*, *C. neapolitanum*, *C. montanum v. Bertolini*, *C. montanum v. angustifolium*, and *C. autumnale v. fl. purpureus*. It also occurs in the leaves of *Merendera caucasica* and *M. sobolifera*, its localisation being almost identical with that of *Colchicum*. The amount of the alkaloid extracted from *C. Cupani* was 0.464 per cent.

In growing plants, the alkaloid tends to migrate to the newly-formed portions and accumulates in the seeds, especially during maturation; it is localised in the parenchymatous cells of the placenta, and is never found in dead cells or in intracellular spaces (compare *Arch. Ital. Biol.*, 33, 73).

The conclusion is drawn that colchicine is not a waste product of protoplasmic activity, but that it is a reserve substance which contributes to the nutrition of the plant. N. H. J. M.

Rôle of Oxydase in the preparation of Commercial Black Tea. By K. Asō (*Bull. Coll. Agr. Tokyo Imp. Univ.*, 1901, 4, 254—259).—The colour of black tea is shown to be produced by the action of oxydase on tannin. In the case of green tea, the oxydase is destroyed during the first treatment in its preparation.

Tea leaves contain nucleo-proteids in which both iron and manganese are present. N. H. J. M.

Tea Plant. By U. SUZUKI (*Bull. Coll. Agr. Tokyo Imp. Univ.*, 1901, 4, 288—296).—Theine is not present in tea seeds, and cannot be obtained from the proteids of the seeds by the action of hydrochloric

acid. The production of theine during germination must be due to a far-reaching transformation of the products of metabolism. Etiolated and normal shoots contain about the same amounts of theine. Cotyledons of germinating seedlings contain very little theine; stems and roots, moderate amounts.

The largest amounts of theine are contained in the leaves, and the quantity present is nearly proportional to their development. Sodium nitrate has no marked effect in increasing the amount of theine; this makes it probable that theine is a product of katabolism, and not of synthesis like asparagine.

The dormant buds are moderately rich in theine, but the bark and trunk of the tea plant only contain doubtful traces. N. H. J. M.

Localisation of Theine in Tea Leaves. By U. SUZUKI (*Bull. Coll. Agr. Tokyo Imp. Univ.*, 1901, 4, 297—298).—On immersing a section of a tea leaf in 0.5 per cent. theine solution, a very marked formation of proteosomes was observed in the cells of the spongy and palisade tissues. As there was no production of proteosomes in the epidermal cells, it is evident that these cells are free from active proteid, and contain the whole of the theine of the leaves. This conclusion was proved to be caused by keeping a section of a tea leaf in a tannin solution (about 3.4 per cent.) for 2 days; a voluminous precipitate consisting of minute globules was produced in the epidermal cells, whilst the other tissues showed only a slight turbidity. The precipitate dissolved in very dilute ammonia and consisted therefore of theine tannate. N. H. J. M.

Occurrence of Paraffins in Tobacco Leaf. By RICHARD KISSLING (*Chem. Zeit.*, 1901, 25, 684).—The author dissents from the view expressed by Thorpe and Holmes (*Proc.*, 1901, 17, 170), that the waxy substance which he previously described (*Abstr.*, 1884, 173) as an ester of a high fatty acid can be a mixture of paraffins. J. J. S.

Cigar Smoke. By JOSEF HABERMANN (*Zeit. physiol. Chem.*, 1901, 33, 55—125. Compare Kissling, *Abstr.*, 1882, 906; Thoms, *Abstr.*, 1900, ii, 428).—The method employed for collecting the products of combustion was somewhat similar to that used by Kissling, except that the burning was intermittent and not continuous. This was accomplished by the aid of a suitable aspirator, which is described in the paper.

The results obtained indicate that only a small portion of the nicotine passes into the aspirated smoke. For the estimation of nicotine, the author has employed Kissling's method, using, however, methyl-orange instead of rosolic acid as indicator.

The smoke from each of the different kinds of cigars employed contained hydrogen sulphide and carbon monoxide, but hydrogen cyanide was not detected, although there is a possibility that some small amount was formed, and condensed before reaching the flask in which the test was made. The amount of carbon dioxide was on the average four times that of the monoxide, and the shape of the cigar does not appear to affect this ratio.

A portion of the basic substances found in the smoke and "ends"

probably consists of nitrogenous compounds formed by the destructive distillation of proteids in the cigars. J. J. S.

Acids Soluble in Ether contained in Molasses Residues. By ALEXANDER HERZFELD (*Zeit. Ver. deut. Zuckerind.*, 1901, 720—745).—The residues from the desaccharification of molasses by the strontia process furnish a suitable sugar-free material for studying the non-saccharine components of molasses. The author discusses the literature of the subject, and then describes his own experiments made on various samples of such residues. Of one sample, 20.6 per cent. of the dry substance was found to dissolve in ether, and of the ether-soluble portion, 4.92 per cent. consisted of formic acid, 20.88 of acetic acid, 20.9 of lactic acid, and about 3 per cent. of propionic, valeric, and butyric acids; succinic acid is also present. The methods of separating and determining these acids are described. T. H. P.

Banana Soils of Jamaica. By HERBERT H. COUSINS (*Bull. Bot. Dept. Jamaica*, 1901, 8, 145—154).—Mechanical and chemical analyses have been made of a number of Jamaica soils. The samples of surface soil (9 inches) were all free from stones and contained very little gravel, being mostly fine silt and sand with some clay (trace to 17.45 per cent.). The following results, per cent. in dry soil passing 3 mm. sieve, are given :

N.	Humus (sol. in ammonia).	Soluble in HCl.				Available.	
		K ₂ O.	CaO.	P ₂ O ₅ .	CO ₂ as CaCO ₃ .	K ₂ O.	P ₂ O ₅ .
1. 0.196	3.58	0.925	1.62	0.138	0.506	0.0272	0.0096
2. 0.143	4.96	0.645	13.59	0.157	23.33	0.0024	0.0048
3. 0.116	2.50	0.745	17.22	0.122	26.92	0.0048	0.0008
4. 0.211	3.15	0.291	0.24	0.025	0.12	0.0150	0.0329
5. 0.704	9.86	0.680	1.38	2.760	0.60	0.0571	0.0908
6. 0.118	1.75	0.572	1.88	0.161	0.22	0.0210	0.0422
7. 0.174	1.59	0.445	2.12	0.134	0.32	0.0242	0.0311

Attention is drawn to the exceptional amount of phosphoric acid in No. 5. N. H. J. M.

Testing of Various Soils as regards their Manurial Requirements. By BERNHARD SCHULZE (*Bied. Centr.*, 1901, 30, 585—586; from *Jahresber. agrik.-chem. Versuchsstat. Landw.-Kammern Prov. Schlesien*, 1899, 15).—Pot experiments were made with the following soils (1) humous loess (K₂O, 0.202; P₂O₅, 0.069; CaCO₃ and humate, 0.184 per cent.); (2) loamy sand (K₂O, 0.042; CaO, 0.519, and P₂O₅, 0.033); (3) sandy loam (K₂O, 0.062; CaO, 0.318, and P₂O₅, 0.075 per cent.); (4) loam (K₂O, 0.113; CaO, 0.319, and P₂O₅, 0.075 per cent.); (5) black loam (K₂O, 0.262; CaO, 1.193, and P₂O₅, 0.142 per cent.). Oats were grown in all the soils, and peas in (5) and (6). The yields of oats and peas obtained without manure, and with nitrogen, potassium, lime, and phosphoric acid in various mixtures, are given in tables.

As regards the wants of the different soils, the conclusion is drawn that No. (2) requires a complete manure, that (2) and (3) decidedly require phosphoric acid, and that (4) and (5) require phosphoric acid

more for peas than for oats. The amount of potassium in (4) sufficed for oats, but not for peas; (5) required potash for both crops, but especially for peas.

N. H. J. M.

Assimilation of Nitrogen and Phosphoric Acid at Three Periods of Growth. By KURT BIELER and K. ASŌ (*Bull. Coll. Agr. Tokyo Imp. Univ.* 1901, 4, 241—254).—Pot experiments with three cereals (barley, wheat, and oats), and two cruciferous plants (rape and mustard) grown in sand manured with the same amounts of double superphosphate, potassium and calcium carbonate, and ammonium sulphate. Plants were taken up for analysis after $2\frac{1}{2}$ and 4 months and after flowering. The amounts of dry produce, including roots, nitrogen, ash, and phosphoric acid were determined in each case.

It was found that the barley plants took up about the same amount of nitrogen as the same number of wheat and oat plants, and that although the amount of total ash of the barley at the end of the experiments was the greatest, the amount of phosphoric acid was the smallest. The manure applied sufficed for the complete development of the wheat and oats, but not for barley.

Rape plants were found to contain rather less nitrogen and phosphoric acid at the end of the third than at the end of the second period, although there were gains both in dry matter and ash.

Both the cereals and *Cruciferae* assimilated about the same amount of nitrogen, but the latter, especially rape, took up more phosphoric acid; of the three cereals, wheat assimilated the greatest amount of phosphoric acid.

N. H. J. M.

Examination of Hay to ascertain the Changes in the Amounts of Food Constituents, Phosphoric Acid, and Potash caused by different Manuring. By BERNHARD SCHULZE (*Bied. Centr.*, 1901, 30, 583—585; from *Jahresber. agrik.-chem. Versuchsstat. Landw.-Kammer Prov. Schlesien*).—Analyses of the hay from three meadows, each divided into several plots under different manurial treatment, showed that potassium manures, when applied alone or with lime, had the greatest effect on the yield of hay; the crop also contained the greatest amount of potassium. The yield of proteids did not always have a decided relation to the manure applied, but was highest when potassium manures were applied alone. The production of carbohydrates was, however, in direct relation to the potassium manuring. Phosphoric acid and calcium did not give any definite results, and the production of fat in the plants could not be directly connected with any manure constituent.

N. H. J. M.

Influence of the Amount of Water in the Soil, and the Manure, on the Yield and Composition of Italian Rye Grass and Clover. By CONRAD VON SEELHORST, N. GEORGS and FAHRENHOLTZ (*Bied. Centr.*, 1901, 30, 625—630; from *J. Landw.*, 1900, 48, 265. Compare Abstr., 1899, ii, 609, and this vol., ii, 274).—Clover and rye grass were grown in small plots of loamy soil without and with minerals; the grass had sodium nitrate in addition to mineral manure. There were three sets of plots: (1) with small, (2) with moderate, and

(3) with large amounts of water. The yields and composition of the produce are recorded.

It was found that an increased supply of water in the soil increased the yields of clover and its chief constituents; it also increased the yield of grass, but not, to any extent, the amount of proteids in the grass, owing to insufficient nitrogen in the soil.

The quality both of clover and grass is injured by excess of water in the soil. Both the proteid and the fat in the first cutting of clover were reduced in quantity. The percentage of ash in clover and grass increased with the amount of water in the soil.

N. H. J. M.

Carob. By J. DUGAST (*Ann. Agron.*, 1901, 27, 444—445; from *J. Agr. prat.*, 1901, i, 598).—The whole fruit (1), the pods (2), and the seeds (3) of carob (*Ceratonia siliqua*) obtained from Algeria was found to have the following percentage composition:

Water.	Nitrog. Matter.	Saccharose.	Glucose.	Starch.	Fat.	Pectic matters.	Cellulose.	Ash.
1. 19.68	5.47	20.32	16.42		0.80	2.88	7.80	2.53
2. 20.40	3.75	23.00	11.20	—	0.57	3.28	8.14	2.47
3. 14.10	18.56	—	—	56.55	2.64	—	5.33	3.00

The numbers under starch include saccharifiable cellulose.

The results show that carob is very suitable as a food for horses. It has been suggested that the fruit might be employed for the production of alcohol, and it is estimated that it would be possible to obtain 30 hectolitres of alcohol per hectare.

N. H. J. M.

Pressed Grapes, compared with Hay and Straw for Cattle Food. By FLORIANO GUERRIERI (*Chem. Centr.*, 1901, ii, 737; from *Staz. sper. agrar. ital.*, 34, 338—346).—The following analyses of pressed grapes show that they are of less value than hay and straw, and can, at most, be employed as a substitute for straw:

Water.	Starch.	Sugar.	Dextrin.	Crude fibre.	Crude fat.	Crude proteid.	N.	Ash.		
16.72	14.58	1.57	3.63	42.53	0.64	2.89	0.588	2.905		
K ₂ O.	Na ₂ O.	CaO.	MgO.	Fe ₂ O ₃ .	Al ₂ O ₃ .	P ₂ O ₅ .	SO ₃ .	SiO ₂ .	Cl.	CO ₂ .
0.25	0.09	0.78	0.02	0.38	0.07	0.17	0.17	0.21	0.005	0.21

N. H. J. M.

Composition and Nutritive Value of Malt Germs and the Dried Residues of Germinated Barley from Italian Breweries. By PIETRO SCARAFIA (*Chem. Centr.*, 1901, ii, 736—737; from *Staz. sper. agrar. ital.*, 34, 321—337).—The results of analyses of malt germs (1 and 2) and of residues (3) differ considerably from those given by Wolff and Settegast:

	Water.	Crude fat.	Crude proteid.	Digestible proteid.	Crude fibre.	Pentosans.	Ash.
1.	14.10	3.46	12.08	6.80	15.24	11.98	9.63
2.	8.59	1.85	15.89	9.29	12.51	13.42	12.64
3.	9.39	6.44	17.99	11.49	17.25	13.66	7.39

N. H. J. M.

Influence of Variety [of Potatoes] and Manures on the Quality of the Starch. By CH. GUFFROY (*Ann. Agron.*, 1901, 27, 442—443; from *J. Agr. prat.*, 1901, i, 539).—Different varieties of potatoes produced starch grains varying widely in size. As regards the effect of manures, it was found that potassium chloride always produced starch of good quality, the grains being smaller than when the sulphate was employed. Complete manure produced the largest grains, whilst dung alone gave less satisfactory results than when employed in conjunction with phosphates. Of the different manures, phosphoric acid always had the greatest effect. N. H. J. M.

Artificial Manures and Humus. By K. DE VRIES (*Ann. Agron.*, 1901, 27, 443—444; from *Deut. landw. Presse*, 1901, 296).—The results of analyses of Groningen soils, some for a long time manured only with artificial manures and others which had received farmyard manure alone, showed that the different manuring had had no effect on the amount of humus. The fact that the soils which had only artificial manures showed no exhaustion of humus is attributed to the humification of the large crop residues. N. H. J. M.

Fermentation of Nitrogenous Substances in Farmyard Manure. By P. PIERRE DEHÉRAIN and C. DUPONT (*Ann. Agron.*, 1901, 27, 401—427).—The ferments of farmyard manure transform the nitrogen of urine, uric acid, and hippuric acid into ammonium carbonate. Hippuric acid only ferments in presence of air, whilst urea and uric acid ferment in an atmosphere of carbon dioxide. In practice, the fermentation is not rapid enough to prevent the addition of litter containing urine to manure heaps without loss of ammonia.

The proteids of farmyard manure ferment very incompletely in absence of air, and not at all in very alkaline media. Most of the nitrogen is converted into ammonium carbonate, a small quantity being liberated in the free state. Carbon dioxide, hydrogen, methane, and, frequently, hydrogen sulphide are produced. N. H. J. M.

Analytical Chemistry.

Practical Methods for the Rapid Spectroscopic Analysis of Gases. By MARCELLIN P. E. BERTHELOT (*Ann. Chim. Phys.*, 1901, [vii], 23, 447—482).—A description of an apparatus employed in the spectroscopic examination of gases under approximately atmospheric pressure, and a table giving the wave-lengths of the prominent lines exhibited under these conditions by volatile elements and compounds.

G. T. M.

Indicators for Use with Artificial Light. By A. KUFFERATH (*Zeit. angew. Chem.*, 1901, 14, 916—918).—A series of experiments

with methyl-orange, fluorescein, cochineal, corallin, *p*-nitrophenol, alizarin-green B, resazurin, and luteol (Autenrieth, *Abstr.*, 1895, i, 572) to ascertain whether these can be successfully used in titrations when using artificial light.

The conclusion drawn is that the source of light is immaterial when using *p* nitrophenol or fluorescein, but when working with the other indicators acetylene light is preferable. L. DE K.

Indirect Weighing of Quantitative Precipitates; Rapid and Accurate Method for Determining the Weight of a Precipitate without Separating it from the Liquid. By R. W. THATCHER (*J. Amer. Chem. Soc.*, 1901, 23, 644—668).—The author's method is briefly as follows:—The metal to be determined is converted in the usual manner into an insoluble compound. The bulk of the liquid is, if necessary, removed, and the remainder, together with the precipitate, is introduced into a pycnometer of known weight and capacity and the whole is weighed. A portion of the clear liquid is then taken off and its sp. gr. ascertained by using a smaller pycnometer. From these data and the known sp. gr. of the precipitate, the weight (x) of the same may be calculated by using the formula $x = d(a - bd')/d - d'$, in which a represents the total weight, b the total volume, d the sp. gr. of the precipitate, and d' the sp. gr. of the liquid.

Specific gravities of precipitates may be readily ascertained as follows. A known weight of, say, pure sodium chloride is precipitated with a sufficiency of silver nitrate, the precipitate is introduced in the pycnometer, which is then filled and weighed; x now being the known quantity, d may be in turn found by calculation. To find the sp. gr. of calcium oxalate, a known weight of pure calcium carbonate is dissolved and precipitated with ammonium oxalate, &c.

L. DE K.

Automatic Filter-Washer. By JAMES MARION PICKEL (*J. Amer. Chem. Soc.*, 1901, 23, 589—593).—The author has devised an automatic filter-washer which is well adapted for washing the soluble phosphates out of commercial fertilisers. A reservoir containing the liquid with which the washing is to be effected is connected by a rubber tube provided with two clamps to the delivery vessel; by means of these clamps the rate of flow can be regulated. In the interior of the delivery vessel is a small intermittent siphon which delivers the liquid on to an inverted funnel covering the substance to be washed; this funnel is of such a size as to nearly cover the filter-paper contained in a larger funnel. E. G.

Analysis of Gases by means of the Electric Spark. By MARCELLIN P. E. BERTHELOT (*Ann. Chim. Phys.*, 1901, [vii], 23, 433—447).—Pure oxygen, when contained over mercury and submitted to the action of the electric spark, yields a small amount of ozone, which superficially oxidises the mercury; a mixture of oxygen and nitrogen gives rise to nitrogen peroxide, the product giving a characteristic pink coloration with ferrous sulphate and concentrated sulphuric acid. Hydrogen is not affected by the electric discharge and this agent does not readily promote its combination with nitrogen to form ammonia. Nitrogen under these

conditions reacts with acetylene or ethylene, giving rise to hydrogen cyanide (compare Abstr., 1897, i, 330). Argon and helium, when mixed with benzene vapour and sparked in the presence of mercury, exhibit respectively their characteristic green and orange-coloured luminescent spectra. Nitrogen monoxide and trioxide, when sparked for some time, yield a mixture of nitrous fumes, oxygen, and nitrogen. The oxides of chlorine detonate under the influence of the electric spark, yielding their constituent elements. Sulphur dioxide is partially decomposed into the trioxide and free sulphur; carbon dioxide after prolonged action yields an appreciable amount of carbon monoxide and oxygen. Carbon monoxide, under similar conditions, yields a mixture of carbon and the dioxide. The hydrides of chlorine, bromine, and iodine are partially decomposed under the influence of the electric spark, whereas hydrogen fluoride is not affected. Water, and the hydrides of sulphur, selenium, and tellurium, undergo a similar decomposition; in all these cases, the action becomes more complete as the atomic weight of the non-metal increases. Ammonia and phosphine are completely decomposed after 2 hours' exposure to the electric discharge; arsine, stibine, and hydrogen silicide are also rapidly resolved into their elements. The hydrocarbons also undergo decomposition, acetylene being in each case an intermediate product; this substance subsequently gives rise to hydrogen and carbon, a limit to this reaction being attained when the volumes of the hydrogen and unaltered hydrocarbon are in the ratio 7:1. Compounds containing carbon, hydrogen, and oxygen decompose under these conditions, yielding acetylene, water, and the oxides of carbon.

Carbon oxysulphide gives rise to carbon monoxide and sulphur, whilst carbon disulphide is resolved into its elements. The mercaptans and thio-ethers are decomposed, yielding hydrogen sulphide, acetylene, hydrogen, sulphur, and carbon.

The alkyl chlorides furnish hydrogen chloride, the corresponding bromides give rise to hydrogen bromide, and the iodides to iodine; in addition to these products, the alkyl haloids yield acetylene, carbon, and hydrogen. Phosphorus trifluoride is resolved into phosphorus and the pentafluoride; the latter compound is not altered by the electrical discharge and in this respect resembles boron chloride and the fluorides of boron, silicon, and sulphur. Cyanogen and cyanogen chloride are resolved into their elements. Hydrogen cyanide is partially dissociated into acetylene and nitrogen. Methylamine and its analogues yield hydrogen cyanide, acetylene, carbon, and hydrogen. G. T. M.

Estimation of Solution of Hydrogen Peroxide. By WILLIAM A. H. NAYLOR and C. S. DYER (*Pharm. J.*, 1901, [iv], 13, 131—132).—The gasometric method of estimating solutions of hydrogen peroxide by means of potassium permanganate and sulphuric acid in a nitrometer charged with brine is rendered inaccurate by the evolution of chlorine, which is incompletely absorbed by the water; the results furnished by this process are considerably higher than those obtained by collecting the oxygen over mercury, but if a saturated solution of magnesium sulphate is substituted for the brine, the results agree with those obtained when mercury is used. In any case, however, the

permanganate method yields somewhat higher results than that of Mason (*Chemist and Druggist*, 1881, 56), which involves the use of potassium dichromate and gives concordant results whether the oxygen is collected over brine, saturated solution of magnesium sulphate, or mercury. E. G.

Estimation of Chlorate in Electrolytic Bleaching Solutions and Potassium Chlorate Lyes. By HUGO DITZ (*Chem. Zeit.*, 1901, 25, 727—728).—A slight modification of the former apparatus (Abstr., 1900, ii, 241). It is now also stated that the reaction between potassium chlorate, potassium bromide, and hydrochloric acid is complete within five minutes; potassium iodide is then decomposed by the liberated bromine and the free iodine titrated. L. DE K.

Estimation of Sulphur in Iron and Steel. By WILLIAM A. NOYES and L. LESLIE HELMER (*J. Amer. Chem. Soc.*, 1901, 23, 675—679).—Five grams of the finely divided sample are dissolved in 200 c.c. of water and 8 c.c. of bromine, and filtered off from any insoluble matter, which must afterwards be tested for sulphur by fusion with oxidising mixture in the usual manner, or 5 grams of the sample are mixed with 7 grams of potassium chlorate and gradually added to 120 c.c. of nitric acid of sp. gr. 1.2 containing 1 gram of potassium bromide; the whole is then evaporated to dryness, and the residue dissolved in hydrochloric acid, when any insoluble matter must also be examined for sulphur. Care should be taken to avoid contact with sulphurous fumes from the illuminating gas.

In either case, the iron solution is poured into 130 c.c. of 10 per cent. ammonia, and the whole diluted to 500 c.c. and filtered through a dry filter. Three hundred c.c. of the filtrate are evaporated to 100 c.c., one drop of hydrochloric acid of sp. gr. 1.12 is added, and the sulphuric acid precipitated as usual by means of barium chloride. The test experiments prove the great accuracy of the method. L. DE K.

Estimation of Sulphur in Oils. By FERDINAND JEAN (*Ann. Chim. anal. appl.*, 1901, 6, 321).—So-called cooling oils contain a small quantity of added sulphur, sometimes to the extent of 0.7 per cent. The author estimates this as follows: 5 grams of the sample are heated at about 150° in an enamelled dish, and saponified by adding 4 c.c. of aqueous sodium hydroxide of sp. gr. 1.33 and 2 c.c. of alcohol; the whole is evaporated to dryness with constant stirring. The mass is dissolved in hot water and the soap separated by saturating the liquid with salt; the precipitate is then washed with brine. The filtrate is mixed with an excess of seltzer water, and the sulphide titrated with *N*/10 iodine, using starch as indicator.

Treated in this manner, a sample of colza oil gave 0.031, and one of rapeseed oil, 0.044 per cent. of sulphur. L. DE K.

Gravimetric Estimation of Tellurium. By ALEXANDER GUTBIER (*Ber.*, 1901, 34, 2724—2726).—In the gravimetric estimation of tellurium by reduction to the metal, hydrazine hydrate or hydrochloride may be employed with great advantage, as the reduction can be carried out in neutral solution, and the reoxidation of the tellurium to telluric

acid is largely avoided. Five analyses of telluric acid by this method showed a maximum error of 0.2 per cent. and two analyses of the dioxide gave values within 0.1 per cent. of the calculated percentage of tellurium.

T. M. L.

[Estimation of Nitrogen] in Urine for Clinical Purposes. By ADOLF JOLLES (*Chem. Centr.*, 1901, ii, 663—664; from *Centr. inn. Med.*, 1901, 22, 719—723).—Five c.c. of urine are mixed with 5 c.c. of water, and 5 c.c. of this are diluted to 150 c.c. and heated with 2 c.c. of sulphuric acid. A solution containing 4 grams of potassium permanganate per litre is now added 1 c.c. at the time, until after 15 minutes' boiling the colour is no longer discharged. By this means, the various minor nitrogenous constituents of urine, uric acid, purine bases, hippuric acid, oxaluric acid, proteids, carboxylic acids, and allantoin furnish products which, like urea and ammonia, yield the whole of their nitrogen as gas when treated with bromine in the presence of sodium hydroxide. The liquid is decolorised by adding a little oxalic acid, made alkaline with sodium hydroxide, and the nitrogen then liberated in the author's azotometer (*Abstr.*, 1900, ii, 450).

L. DE K.

Estimation of Ammonia in Animal Liquids and Tissues. By MARCELLUS NENCKI and J. ZALESKI (*Zeit. physiol. Chem.*, 1901, 33, 193—209).—The percentages of ammonia obtained by the method previously described (*Abstr.*, 1897, ii, 343) vary with the proportions of blood and lime-water employed; the authors now recommend the distillation of the blood itself diluted with water, as it contains sufficient alkali to decompose all ammonium salts present. Good results are also obtained when magnesia is employed in place of lime-water; the addition of magnesia has the advantage that it prevents frothing and an excess does not affect the result. The distillation is carried out at a temperature of 30° under reduced pressure, and it is necessary to continue the operation until two-thirds of the liquid has passed over. The distillation is facilitated by introducing a vertical condenser and receiver between the vessel which contains the acid and the pump. With animal tissues, it is necessary to macerate thoroughly by grinding with fine sand, before the distillation is carried out.

The amounts of oxygen absorbed when alkaline solutions of the following proteids—serum-albumin, serum-globulin, and oxyhæmoglobin from horses' blood—are exposed to the atmosphere have been determined by the method previously described (Nencki and Sieber, *J. pr. Chem.*, 1882, [ii], 26, 6).

J. J. S.

Rapid Estimation of Nitrates in Soils. By CARLO MONTANARI (*Chem. Centr.*, 1901, ii, 793—794; from *Staz. sperim. agrar. ital.*, 1901, 34, 690—693).—The author applies Grandval and Lajoux's method for estimating nitric acid in water or air to soils. Ten to 20 grams of the carefully selected sample are mixed with 100 c.c. of water and frequently shaken for some hours. Fifty c.c. of the filtrate are then shaken with 1—2 grams of purified animal charcoal and filtered, 10 or 20 c.c. of the filtrate are evaporated to dryness on the water-bath, and treated in the cold with a reagent made by dissolving 3 grams of crystallised phenol in 37 grams of sulphuric acid. After adding some water and supersaturating with ammonia, the liquid is diluted to 100, 250, 500, or

more c.c., and the colour is then compared with a solution obtained in a similar way from a known quantity of potassium nitrate.

L. DE K.

Estimation of Phosphorus and Sulphur in Acetylene and other Combustible Gases. By PAUL EITNER and GUSTAV KEPPELER (*Chem. Centr.*, 1901, ii, 662; from *J. Gasbel.*, 1901, 44, 548—552).—The gas is collected over brine in a gasometer and then burnt in a blowpipe burner supplied with oxygen. By means of an arrangement similar to that employed in the estimation of sulphur in illuminating gas, the products of combustion are drawn through two ten-bulb tubes containing water and an alkaline solution of bromine and connected with an empty Volhard tube. The phosphoric and sulphuric acids are then estimated as usual; a portion of the former deposits on the sides of the apparatus before it reaches the absorbing tubes and must be estimated separately.

L. DE K.

Simplification of Meineke-Woy's Method of Estimating Phosphoric Acid as Phosphomolybdic Oxide; Precipitation of pure Ammonium Phosphomolybdate by Molybdate Solution containing Citric Acid; Conversion of Wagner's Molybdate Magnesia Process into a purely Molybdate one. By ANTON SEYDA (*Chem. Zeit.*, 1901, 25, 759—768).—The author has found by a series of experiments that the most accurate way of estimating phosphoric acid, including citrate-soluble acid, is its conversion into phosphomolybdic oxide.

The only possible objection to the process is the probable precipitation of free molybdic acid, particularly in the presence of a large excess of molybdate solution. This is, however, rarely the case when precipitating in the cold and using a stirring apparatus for 15 minutes. If no citric acid is already present, an addition of 2 grams of it will prevent the precipitation of molybdic acid. Solutions containing no iron may be heated to 30°, but those containing it, not higher than 20°; in this case, the liquid should be filtered 15 minutes after it ceases to be stirred. If the presence of free molybdic acid is suspected, the precipitate should be redissolved in dilute ammonia, mixed with 50—100 c.c. of dilute molybdate solution, and precipitated hot with nitric acid; this operation may sometimes require repeating. (For the exact strength and proportions of the reagents, the original paper should be consulted.) The liquid may be filtered while still hot and the precipitate washed with a hot solution containing 5 per cent. of ammonium nitrate and 1 per cent. of nitric acid. Alcohol of 95 per cent. should be used to rinse the precipitate from the sides of the porcelain Gooch crucible. The conversion of the precipitate into the oxide is only complete when it has an uniform appearance throughout its mass. L. DE K.

Estimation of Phosphates in Potable Waters. By CHARLES LEPIERRE (*Bull. Soc. Chim.*, 1901, [iii], 25, 800).—The method described by Woodman and Cayvan (this vol., ii, 344) for the estimation of phosphates in potable waters is identical with that previously published by the author (*Abstr.*, 1898, ii, 47).

N. L.

Arsenic in Coal and Coke. By ALFRED C. CHAPMAN (*Analyst*, 1901, 26, 253—256).—A large quantity of the sample is finely powdered and well mixed; 0.5—2 grams are then carefully mixed with 2 grams of magnesium oxide and 0.5 gram of anhydrous sodium carbonate and introduced into a deep silver crucible. This is supported in a slanting position and heated by a flame so as to keep the bottom at a dull red heat, the contents being occasionally stirred by means of a platinum wire. After about one hour, the oxidation is complete, but to make sure 0.5 gram of ammonium nitrate is added and a stronger heat applied for five minutes. When cold, the contents are transferred to a beaker, dissolved in dilute sulphuric acid, and heated to expel any nitric acid. This solution is then quantitatively tested for arsenic in the Marsh-Berzelius apparatus, the mirrors obtained being compared with standards.

Tables are given showing the amount of arsenic found in coal, in the coke obtained therefrom, and also in the ashes. A small proportion of the arsenic is retained in the ash as ferric arsenate or calcium arsenate.

L. DE K.

Method for the Destruction of Organic Matter applicable to the Detection of Inorganic Poisons, more especially Arsenic and Antimony. By GEORGES DENIGES (*J. Pharm. Chim.*, 1901, [vi], 14, 241—246).—The organic matter is destroyed, first by treatment with concentrated nitric acid and potassium permanganate and finally with concentrated sulphuric and nitric acids. The method is rapid, and of general application to all toxicological analyses for inorganic poisons.

H. R. LE S.

Estimation of Boric Acid. By G. CARNIELLI (*Gazzetta*, 1901, 31, i, 544—553).—The author has examined the various methods which have been proposed for the estimation of boric acid and draws the following conclusions from his results.

The Berzelius-Stromeyer process of precipitation as potassium fluoborate is untrustworthy, especially when used for sodium compounds of boric acid.

The Rosenblatt-Gooch method, depending on the ready volatility of ethyl borate, gives moderately concordant results when carefully carried out and when all the precautions suggested by Moissan (*Abstr.*, 1893, ii, 435) are taken.

Smith's plan (*Chem. News*, 1882, 46, 286) of precipitating boric acid by means of manganous sulphate and determining the excess of the latter by titration with permanganate, gives good results when carried out according to the present author's modification, which is as follows. Ten c.c. of a 4 per cent. borax solution are mixed with 20 c.c. of a 0.6 per cent. manganous sulphate solution and 30 c.c. of strong alcohol, the liquid being left in a covered beaker for half an hour and then filtered, the precipitate being washed with strong alcohol to remove all the manganous sulphate. The total filtrate is then evaporated to dryness on a water-bath, the residue dissolved in water, and the solution mixed with 7 c.c. of an 80 per cent. zinc sulphate solution and faintly acidified; the liquid is then heated to boiling, poured into a measuring flask to which is also added a strong excess of standard permanganate

solution. After making up to volume with distilled water, aliquot parts of the solution are titrated with decinormal oxalic acid to determine the excess of permanganate.

Thomson's volumetric method (Abstr., 1894, ii, 28), in which the boric acid is set free and then titrated with standard alkali solution in presence of glycerol, using phenolphthalein as indicator, is rapid and accurate.

The spectroscopic method proposed by Führ (*Zeit. anal. Chem.* 1887, 26, 79) gives good results, but not for very small quantities of boric acid.
T. H. P.

Estimation of Carbon in Steel and Iron. By SCHMITZ (*Chem. Zeit.*, 1901, 25, 684—685).—The steel borings are dissolved as usual in a mixture of dilute sulphuric acid, chromic acid, and copper sulphate in a special flask and the gases evolved are passed by means of a current of air over platinum spirals heated to redness. The carbon dioxide after being dried is then absorbed in the usual manner by soda-lime.
L. DE K.

Oxidation of Organic Nitrogen Compounds and the Estimation of the Carbon and Nitrogen therein by the Moist Process. By MISS E. VAN AKEN (*Proc. K. Akad. Wetensch. Amsterdam*, 1901, 4, 91—95).—Using Fritsch's method (Abstr., 1897, ii, 124) of simultaneously estimating carbon and nitrogen in organic substances, the author finds that carbamide, dimethyl- and tetramethyl-carbamide, acetylcarbamide, and thiocarbamide yield only half their nitrogen as ammonia.

Cyclic nitrogen compounds, such as alloxan and malonureide, behave similarly; with uric acid and caffeine, the deficit is not so large. Oxamide, although giving more than half its nitrogen as ammonia, exhibits a much larger deficit than malonamide, succinamide, or asparagine. Fritsch appears to be incorrect in stating that his process is applicable to all nitrogen compounds which can be analysed by Kjeldahl's method.
K. J. P. O.

[Analysis of Mixtures of Carbon Oxysulphide, Hydrogen Sulphide, and Carbon Dioxide.] By WALTHER HEMPEL (*Zeit. angew. Chem.*, 1901, 14, 865—868).—See this vol., ii, 651.

Estimation of Free Alkali in the Presence of Carbonate. By W. E. RIDENOUR (*Chem. Centr.*, 1901, ii, 741; from *J. Franklin Inst.*, 1901, 152, 119—121).—According to Thompson, the liquid is first titrated with *N*-hydrochloric acid, using phenolphthalein as indicator; this gives the free alkali and half of the carbonate. After adding methyl-orange, the titration is continued, and the other half of the carbonate is thus estimated. The author has found that this is not strictly correct, and that the process may be improved by means of the following correction. To obtain the number of c.c. of *N*-hydrochloric acid which correspond with the carbonate contained in the mixture, the result of the methyl-orange titration should be multiplied by 2 and divided by the factor 104.5726.

L. DE K.

Precipitation and Separation of Silver by Electrolysis. By W. H. FULWEILER and EDGAR F. SMITH (*J. Amer. Chem. Soc.*, 1901, 23, 582—585).—By the electrolytic method, silver can be completely separated from copper, from copper and cadmium if the electrolyte is heated at 75—80° before passing the current, and also from cadmium, zinc, and nickel. E. G.

Estimation of Calcium, Strontium, and Barium as the Oxalates. By CHARLES A. PETERS (*Amer. J. Sci.*, 1901, [iv], 12, 216—224).—Calcium oxalate is completely precipitated from a solution containing an excess of ammonium oxalate, but the precipitate must not be washed too much, as it is appreciably soluble in pure water. Strontium oxalate is completely precipitated by ammonium oxalate from a solution containing 1/5 of its volume of 85 per cent. alcohol. The precipitation of barium oxalate is complete if the solution contains 1/3 of its volume of 85 per cent. alcohol.

Calcium, strontium, and barium oxalates, after decomposition with hydrochloric acid, may be accurately titrated with permanganate if some manganous salt be added.

Strontium and barium oxalates (like calcium oxalate) are converted into carbonates by ignition, and may be weighed in this form.

J. McC.

Simple Reaction for distinguishing Aragonite and Calcite. By W. MEIGEN (*Centr. Min.*, 1901, 577—578).—The finely powdered mineral is placed in a dilute solution of cobalt nitrate and this boiled for a few minutes. In the presence of aragonite, there is a lilac-red precipitate of basic cobalt carbonate, whilst calcite remains white, or, in the presence of organic matter, becomes yellowish. Barium and strontium, but not magnesium, carbonates give the same result as aragonite, and calcium phosphate produces a blue precipitate. This reaction is made use of for the purpose of distinguishing calcite and aragonite in various animal and vegetable secretions of calcium carbonate.

L. J. S.

Volumetric Estimation of Lead Dioxide in Red Lead. By MAX LIEBIG (*Zeit. angew. Chem.*, 1901, 14, 828).—0.5 gram of the sample is rinsed with a little water into a small Erlenmeyer flask and 25 c.c. of *N*/10 sodium thiosulphate are added. Ten c.c. of acetic acid (containing not more than 40 per cent. of real acid) are now added in order to dissolve the substance. After introducing 10 c.c. of a solution of potassium iodide (1 : 10) and starch solution as indicator, the excess of thiosulphate is titrated with *N*/10 iodine. The end reaction is noticed by the bright yellow lead iodide becoming discoloured. The number of c.c. of iodine consumed multiplied by 239 represents the percentage of lead dioxide in the red lead.

L. DE K.

Electrolytic Separation of Mercury from Copper. By C. ROSCOE SPARE and EDGAR F. SMITH (*J. Amer. Chem. Soc.*, 1901, 23, 579—582).—In reply to the statement of Emil Goecke (*Inaug. Diss.*) that the separation of mercury from copper cannot be satisfactorily effected electrolytically, the authors publish the results of a number of estimations to prove the accuracy of the method; unlike

Goecke, they find that the deposit of mercury is free from copper. They also obtained satisfactory results in the presence of copper, cadmium, and zinc. E. G.

Comparison of the Quantitative Action of Reducing Agents on Mercury and Bismuth Salts. By THOMAS TYRER and CHAS. T. TYRER (*Pharm. J.*, 1901, [iv], 13, 144).—A comparison of a modification of the method for the estimation of mercury by reduction with hypophosphorous acid described by Bennett (this vol., ii, 131) with other reduction methods.

Stannous chloride gives low results owing to the loss occasioned by the fine state of division of the mercury. With formaldehyde in alkaline solution, the same difficulty occurs, whilst in acid solution the reduction is incomplete. Phenylhydrazine in alkaline solution produces only partial precipitation, and in acid solution no reduction takes place. With sodium arsenite in acid solution, reduction is slow and incomplete, but in presence of an alkali, complete reduction occurs; the results, however, are somewhat lower than those obtained by the hypophosphorous acid method. A strongly alkaline solution of potassium antimony tartrate effects complete reduction, but the product is contaminated with traces of an antimony salt. By boiling solutions of mercury salts with phosphorous acid in large excess, fair results are obtained. A modification of the method of Vanino and Treubert (*Abstr.*, 1897, ii, 601), in which hypophosphorous acid is used in presence of hydrogen peroxide, is also found to be satisfactory.

Estimations of bismuth salts were made with hypophosphorous acid and with formaldehyde, but although good results were obtained, neither process has any advantage over the sulphide method.

E. G.

Estimation of Metallic Iron in reduced Iron. By ALBERT MARQUARDT (*Chem. Zeit.*, 1901, 25, 743—744).—A modification of the process laid down in the German Pharmacopœia. 0.3 gram of the reduced iron is introduced into a glass-stoppered 25 c.c. flask and a solution of 1 gram of potassium iodide in 4 c.c. of water is added, together with 1.5 gram of pure iodine. The mixture is allowed to stand for an hour, being thoroughly shaken every 10 minutes. The solution is then diluted to 100 c.c. and the excess of iodine titrated according to the earlier directions. L. DE K.

Formation of Carbon during the Electrolysis of Ammonium Oxalate. By HANS VERWER (*Chem. Zeit.*, 1901, 25, 792—793).—Avery and Dales (*Abstr.*, 1899, ii, 814) have stated that iron deposited by electrolysis from a solution containing ammonium oxalate contains carbon. The author finds that such is the fact, particularly when a high tension current is used. In any case, however, no separation of carbon takes place until the greater portion of the iron has been deposited. It also appears that carbon is not deposited directly from the oxalate, but from the ammonium carbonate or ammonium hydrogen carbonate, which results from the electrolytic decomposition of the oxalate. On dissolving the iron, an odour of hydrocarbons is noticed, showing that the carbon, partially at least, is in a state of combination with the iron. L. DE K.

Reduction of Ferric Salts. By GILBERT T. MORGAN (*Analyst*, 1901, 26, 225—227).—Instead of using granulated zinc for the reduction of ferric salts, the author prefers a zinc-copper couple, produced by immersing 8 grams of granulated zinc in 200 c.c. of a 10 per cent. solution of copper sulphate. The reduction is complete after 10 minutes, and the liquid may be decanted from the zinc and, if necessary, passed through a filter. No iron is precipitated and retained by the undissolved zinc.

L. DE K.

Potassium Thiocyanate as Indicator when Reducing Ferric Salts. By LUCIEN L. DE KONINCK (*Chem. Centr.*, 1901, ii, 661; from *Bull. Assoc. belge Chim.*, 1901, 15, 230).—Ebeling's proposal to add potassium thiocyanate when a ferric solution is being reduced with zinc (this vol., ii, 424, 480) is not to be recommended. Potassium thiocyanate is reduced by zinc, and any portion which has escaped reduction is readily oxidised by permanganate.

L. DE K.

Qualitative Detection of Small Quantities of Nickel in the Presence of Cobalt. By HUGO DITZ (*Zeit. angew. Chem.*, 1901, 14, 894—897).—The solution, which should be neutral, is mixed with potassium chromate in slight excess, and heated in a spacious flask to boiling. Five to 10 grams of potassium sodium tartrate are now added, and the boiling continued for several minutes. After cooling for some time and adding a little more water, should the colour be too strong, the liquid is examined for any brown deposit of nickel chromate. This deposit is, however, not quite free from cobalt, so the method is, as yet, only of qualitative interest.

L. DE K.

Rapid Method for the Evaluation of Chromic Acid and Soluble Chromates. By LYMAN F. KEBLER (*Chem. Centr.*, 1901, ii, 708—709; from *Amer. J. Pharm.*, 1901, 73, 395—397).—One gram of the sample is dissolved in water to 100 c.c., 20 c.c. are put into a porcelain basin containing 75 c.c. of water and 2 grams of potassium iodide, and 15 c.c. of 10 per cent. sulphuric acid are added. The liberated iodine is then titrated as usual with $N/10$ sodium thiosulphate, 1 c.c. of which represents 0.003329 gram of chromium trioxide, or 0.004896 gram of potassium dichromate. The author has met with two samples of chromic acid containing a large proportion of sodium hydrogen sulphate.

L. DE K.

Electrolytic Estimation of Molybdenum. By LILY G. KOLLOCK and EDGAR F. SMITH (*J. Amer. Chem. Soc.*, 1901, 23, 669—671).—Molybdenum may be accurately determined in the mineral molybdenite by fusing the latter with alkali nitrate and carbonate. The fused mass is extracted with water, the filtrate acidified with sulphuric acid, and the liquid submitted to electrolysis, using a current of 0.1 ampere and 4 volts, the temperature being 75°. When precipitation is complete, the hydrated sesquioxide deposit after being washed is dissolved in dilute nitric acid, the solution evaporated to dryness, and the residue gently heated to remove the last traces of nitric acid, and then weighed as molybdic acid; if any blue spots are visible, these should be moistened with nitric acid and the drying

repeated. If it be desired to estimate the sulphur also, acetic acid may be substituted for sulphuric acid; the electrolysis then, however, occupies a longer time.

L. DE K.

Electrolytic Estimation of Uranium. By LILY G. KOLLOCK and EDGAR F. SMITH (*J. Amer. Chem. Soc.*, 1901, 23, 607—609).—Uranium can be accurately estimated in solutions of the acetate, sulphate, or nitrate by the electrolytic method. If iron, chromium, nickel, or cobalt is present, the method fails, but uranium can be completely separated from barium, calcium, magnesium, or zinc in solutions of their acetates.

E. G.

Precipitation of Tin from its Sulpho-salts and its Separation from Antimony by Electrolysis. By HERMANN OST and W. KLAPPROTH (*Zeit. angew. Chem.*, 1901, 14, 817—827).—The authors have continued their researches on the electrolytic deposition of tin and antimony, using a cell with a diaphragm (*Abstr.*, 1900, ii, 692), and communicate the results in eight tables. Several illustrations are also given, one being of a modification of the former apparatus.

The separation of tin and antimony is finally recommended to be carried out as follows:—The mixed sulphides, obtained in due course, and containing at most 0.5 gram of total metal, are dissolved in as little sodium sulphide as possible and the solution is diluted to a definite bulk. In one-half of the liquid the antimony alone is estimated by adding 8 grams of sodium sulphide and water up to 80—96 c.c., and using a current of 0.1—0.2 ampere in the cold for 7 hours.

In the other portion, both tin and antimony are precipitated by adding sufficient ammonium sulphate to convert all the sodium sulphide into the ammonium compound. In addition, 40 grams of sodium sulphate are added, also 10 c.c. (= 2 grams) of ammonium sulphide. After diluting to 80—90 c.c., the liquid is electrolysed by a current of 0.3—0.5 ampere. After two hours, the precipitation is generally complete. The cathode with the sulphur precipitate is then taken from the first cell, placed in another cell containing 25 grams of sodium sulphate in 125 c.c., and a current of 0.5—1 ampere continued for an additional half-hour.

L. DE K.

Estimation of Platinum and Iridium in Platinum Ore. By ÉMILE LEIDIÉ and QUENNESSEN (*Bull. Soc. Chim.*, 1901, [iii], 25, 840—842).—The method devised by Leidié (this vol., ii, 62) for the separation of the platinum metals may be simplified when the estimation of platinum or its commercial extraction only is required. The ore is treated with aqua regia and the solution evaporated to dryness, the residue dissolved in water, treated with sodium nitrite and carbonate to remove iron, lead, &c., and distilled in a current of chlorine to remove osmium and ruthenium. The liquid is then neutralised by hydrochloric acid, and the rhodium and iridium precipitated by means of sodium nitrite and potassium chloride. The platinum and palladium nitrites remaining in solution are converted into chlorides by evaporation with hydrochloric acid, and the metals precipitated by heating with formaldehyde in alkaline solution, heated in hydrogen, dissolved in aqua regia, the palladium chloride reduced by

nitric oxide, and the platinum precipitated by ammonium chloride. Iridium is best estimated in another portion of the liquid from which osmium and ruthenium have been removed in the manner previously described (*loc. cit.*).
N. L.

Estimation of the Dissolved Gases in Natural Waters. By LUDWIG W. WINKLER (*Zeit. anal. Chem.*, 1901, 40, 523—533).—The total carbon dioxide is estimated as follows: In a 250 c.c. flask with a neck 5—6 mm. in diameter, and with a piece of black caoutchouc tube slipped over the neck, 50 c.c. of dilute hydrochloric acid are boiled until all air is expelled. The caoutchouc tube is closed with a clamp, and the exhausted flask cooled and weighed. The neck is then connected with a bent tube dipping into the water to be examined, and on opening the clamp a quantity of the water is drawn into the flask. The amount is found by reweighing the flask; a delivery tube is adjusted and the carbon dioxide is boiled out, collected over mercury, and measured. To ascertain how much of it is in combination with bases, the water is titrated with *N*/10 acid and methyl-orange.

Dissolved oxygen and nitrogen may be expelled from a natural water by filling completely with the water a 500 c.c. flask, at the bottom of which lies 10 grams of calcite (in fragments free from dust) and adding 20 c.c. of hydrochloric acid (sp. gr. 1.19). If this is done skilfully, a rubber stopper carrying an evolution tube can be adjusted before any gas is evolved. The oxygen and nitrogen are completely expelled in 15—20 minutes. The gases are collected in a burette over sodium hydroxide solution, and measured after replacing this with pure water. The oxygen is then absorbed by alkaline pyrogallol introduced through the stopcock of the burette.
M. J. S.

Neutral-red as a means of detecting *Bacillus Coli* in Water. By R. H. MAKGILL (*J. Hyg.*, 1901, 1, 430—436).—The neutral-red test is rapid and delicate. A negative result may be taken as evidence of the absence of *Bacillus coli*. A positive result is always obtained if the *B. coli* is present, but it is advisable in such cases to use confirmatory tests. The reaction may even be employed as a rough quantitative method.
W. D. H.

Neutral-red in the Bacteriological Examination of Water. By WILLIAM G. SAVAGE (*J. Hyg.*, 1901, 1, 437—450).—The neutral-red test is of great value in the routine examination of water. Although a positive result is not absolutely diagnostic of the presence of *Bacillus coli*, it is very nearly so.
W. D. H.

Comparison of the Solubility of Acetylene and Ethylene. By SAMUEL A. TUCKER and HERBERT R. MOODY (*J. Amer. Chem. Soc.*, 1901, 23, 671—674).—In order to find a reagent which will absorb acetylene and leave ethylene undissolved, ammoniacal cuprous chloride was first tried, but was found to be useless for the purpose since it readily dissolves ethylene, although the gas is very slightly soluble in water or solution of ammonia. Both acetylene and ethylene are soluble in alcohol or acetone. Fuming sulphuric acid does not effect a separation, since acetylene is absorbed by it to a considerable extent. Finally, it was found that solution of ammonio-chloride of silver is an

excellent solvent for acetylene, whilst ethylene is almost insoluble in it.

E. G.

Testing Marc and Plum Brandies. By ALEXANDER ZEGA (*Chem. Zeit.*, 1901, 25, 793—794).—The analysis is restricted to the estimation of the free and combined acidity (expressed as potassium hydroxide) alcohol, extract and ash, fusel oil and the testing for aldehyde, furfuraldehyde, and in the case of plum brandy for hydrocyanic acid. An important factor is the behaviour of the distillate towards $N/100$ potassium permanganate.

The free and total acidity are taken in the usual manner and the combined acidity is found by difference. In one instance, 100 c.c. of the sample required 0.0672 gram of potassium hydroxide to neutralise the free acid, and 0.0266 gram for the combined acid. When testing diluted commercial alcohol, it will be found that it is the combined acid which exceeds the free. The following proportion between combined and total acidity has been observed. In the case of marc brandy it varies from 1 : 1.25 minimum to 1 : 5.2 maximum; for plum brandy from 1 : 4 to 1 : 8.4; for diluted alcohol from 1 : 1.3 to 1 : 1.75.

If 1 c.c. of $N/100$ permanganate is added to 1 c.c. of the distillate contained in a 50 c.c. stoppered cylinder, it will be noticed that the brandies are more quickly oxidised than the spirit. When the mixture has turned yellowish-brown, the marc brandy and the spirit both smell of aldehyde, whilst the plum brandy has the characteristic odour of plum stones. On adding another c.c. of permanganate and waiting until the mixture has again turned yellow, the marc brandy smells of ethyl heptoate, the plum brandy has retained its odour, and the spirit has nearly lost its aldehydic odour and smells faintly of acetic acid.

L. DE K.

Characteristic Reaction of Phenol. By MANSEAU (*Rev. Intern. Falsific.*, 1901, 14, 96—97).—If to an alcoholic solution of phenol is added a little ammonia and then an alcoholic solution of iodine, the latter is at first very quickly absorbed, then somewhat more slowly, and finally the liquid turns a permanent bright green, even when heated, or acidified with hydrochloric acid. Nitric or sulphuric acids destroy the colour. If an aqueous solution of phenol is to be tested, it must be mixed with an equal volume of alcohol.

None of the other phenols, such as thymol, resorcinol, naphthol, catechol, quinol, pyrogallol, creosote, or guaiacol, gives the green colour. On adding ammonia to their alcoholic solutions, catechol turns reddish-brown, quinol saffron-yellow, pyrogallol blackish-brown, resorcinol gooseberry-red changing to violet, the others are not affected. On now adding iodine, creosote turns greenish-brown; thymol flesh-red, changing on adding excess of iodine to brick-red; resorcinol assumes a colour of old brandy; naphthol turns lemon-yellow, yielding on addition of more iodine a precipitate similarly coloured. Catechol turns catechu colour without formation of a precipitate; pyrogallol turns completely black; quinol turns reddish-black; resorcinol does not change. Guaiacol behaves like creosote, and salicylic acid, although first turning yellowish-green, changes to brown and yields a precipitate.

L. DE K.

Estimation of Phenol when mixed with Resinous Substances. By JOHN C. THRESH (*Pharm. J.*, 1901, [iv], 13, 138).—In "carbolised gauze," largely used in surgery, the phenol is "fixed" on the gauze by aid of resin. The amount of phenol may be estimated as follows. The gauze is placed in a flask, dilute hydrochloric acid and a few fragments of granulated zinc are added, the flask is heated, and the phenol estimated in the distillate by means of bromine.

E. G.

Titration of Phenol, Salicylic Acid, and Salol in Surgical Dressings. By FERNAND TELLE (*J. Pharm. Chim.*, 1901, [vi], 14, 289—291. Compare this vol., ii, 357).—Two grams of the finely cut cotton or gauze dressing are digested with alcohol (95°) and 2 c.c. of aqueous sodium hydroxide; 40—50 c.c. of water are then added and the liquid boiled for a few minutes. It is next diluted with water to 200 c.c., and 1.5 c.c. more added to allow for the volume occupied by the gauze or cotton. The liquid is filtered and the filtrate titrated as described in the former communication.

H. R. LE S.

Influence of Foreign Substances on Trommer's Sugar Test. By A. CIPOLLINA (*Chem. Centr.*, 1901, 25, 709—710; from *Deut. med. Woch.*, 1901, 27, 440—442).—The yellow precipitate or coloration often noticed when testing for dextrose with copper sulphate and aqueous sodium hydroxide is not necessarily due to the presence of creatinine, as it may be also caused by a 4 per cent. solution of sarcolactic acid, a 1 per cent. solution of allantoin, a 2 per cent. solution of lactic acid or asparagine, or a strong solution of isobutyric acid, benzoic acid, or thymol. The presence of an equal bulk of alcohol has also the same effect. With the exception of creatinine, these substances only interfere when present in large quantities, and on adding more alkali the yellow colour changes to red. The "yellow Trommer reaction" is therefore a characteristic test for creatinine.

Creatine behaves indifferently. A 0.1 per cent. solution of guanidine carbonate in a 1 per cent. solution of sugar (? dextrose) also gives the yellow reaction if excess of alkali be avoided; a 0.1 per cent. solution of glycoeyamine also gives the reaction; weaker solutions do not. Glycoeyamidine behaves like glycoeyamine.

L. DE K.

Estimation of Lactose in Milk. By C. RIEGLER (*Ann. Sci. Univ. Jassy*, 1901, 1, 321—325).—The proteid matter is first removed by treating 10 c.c. of the milk with an equal volume of a 4 per cent. solution of β -naphthalenesulphonic acid. The mixture is warmed to 70—80°, then made up to 100 c.c. with water, and filtered through a dry paper. Fifty c.c. of the liquid are boiled for 6 minutes with 50 c.c. of Fehling's solution, and after the cuprous oxide has settled, the supernatant liquid is poured off. The cuprous oxide is transferred to a tube by means of as little water as possible and to it is added 10 c.c. of an alkaline solution of Rochelle salt and 0.5 gram of hydrazine sulphate. The tube is placed in a thermostat, and when the temperature equilibrium has been established it is connected with a nitrometer. The contents of the tube are boiled for two minutes and the tube replaced in the thermostat. Nitrogen is evolved according to

the equation: $\text{N}_2\text{H}_4 + 2\text{Cu}_2\text{O} = 2\text{H}_2\text{O} + \text{N}_2 + 4\text{Cu}$. From the volume of nitrogen the weight is found, and from a table given the weight of lactose in 5 c.c. of the milk is obtained:

10 mg. nitrogen	=	64.8 mg. lactose.
15 "		98.4 "
20 "		132.7 "
25 "		167.0 "
30 "		202.0 "
35 "		237.9 "
40 "		274.3 "

J. McC.

Analysis of Explosives. By F. W. SMITH (*J. Amer. Chem. Soc.*, 1901, 23, 585—589).—*Estimation of sulphur in gelatin dynamite.*—Two grams of the sample are introduced into a 100 c.c. silver crucible filled two-thirds with an alcoholic solution of sodium hydroxide. The mixture is heated until the nitroglycerol is decomposed and then evaporated to dryness. Forty grams of potassium hydroxide and 5 grams of potassium nitrate are added and the whole is fused until all organic matter is burnt. The mass is then dissolved in dilute acetic acid and the sulphuric acid estimated as usual.

Indirect estimation of nitroglycerol in gelatin dynamite, &c.—Fifteen grams of the sample are extracted with chloroform in a Soxhlet apparatus and the loss in weight is noted; in another portion, the moisture is determined by desiccation over sulphuric acid for 5 days. Another portion of 2 grams is carefully extracted by maceration with ether in a small beaker. The ether is poured through a filter, the extraction repeated three or four times, the ethereal solution allowed to evaporate and the residue mixed with 5 c.c. of ammonium sulphide and 10 c.c. of alcohol. After heating gently on the water-bath until the nitroglycerol is decomposed, 250 c.c. of water and a slight excess of hydrochloric acid are added and the precipitate is first washed free from acid and then extracted with alcohol and chloroform, the filtrate being collected in a weighed platinum dish. After evaporating and drying at 50°, the contents are weighed and then transferred to a silver crucible and examined for sulphur in the manner first described. The weight of the residue less the sulphur represents the substances soluble in chloroform in the original sample except nitroglycerol, moisture, and sulphur. The percentages of the former substances *plus* the moisture and sulphur in the original sample deducted from the total matter soluble in chloroform are equal to the percentage of nitroglycerol. In another portion, the residue in the platinum dish may be examined for resins, paraffin, &c.

Use of Lunge's nitrometer.—This is best standardised by the "empirical method." Nitric oxide, derived from a known amount of pure potassium nitrate, is passed into the measuring tube and the quantity of air in the reduction tube is then varied until the volume of the nitric oxide is approximately the calculated amount. The reduction tube is now sealed, a series of tests made with slightly varying amounts of potassium nitrate, and in each case a correction factor determined which shows 100 per cent. in purity in the

nitrate taken. A sample of pure dry nitroglycerol may also be used. The extreme variations in the determinations should not exceed 0.05 per cent. From the average of the determinations, a correction factor is obtained, which is then applied to all determinations. The sulphuric acid best suited for nitrometer work contains 94—95 per cent. of acid.
L. DE K.

Estimation of Glycogen. By ALFONS BUJARD (*Zeit. Nahr.-Genussm.*, 1901, 4, 781).—Lebbin's process (this vol., ii, 45) is not based on a new principle, as the author since 1897 has made use of alcoholic potash to separate proteids from glycogen in the following way. The meat is dissolved in 8 per cent. alcoholic potash, diluted with 50 per cent. alcohol and the insoluble residue well washed with the latter. The crude glycogen is then dissolved in 8 per cent. aqueous potash, filtered, faintly acidified with acetic acid, and precipitated with alcohol. The precipitate requires no further purification. L. DE K.

Occurrence and Estimation of Lactic Acid in Wines. By RUDOLF KUNZ (*Zeit. Nahr.-Genussm.*, 1901, 4, 673—683).—Two hundred c.c. of wine are mixed with a slight excess of powdered barium hydroxide and evaporated to about two-thirds of the original volume. When cold, the whole is rinsed into a 200 c.c. flask, which is then filled up to the mark; 150 c.c. of the filtrate are evaporated to a thin syrup after neutralising the excess of baryta with carbon dioxide, and when cold, excess of dilute sulphuric acid is added, and the whole introduced into a Schacherl extraction apparatus where the liquid is extracted with ether for 18 hours. The ether in the extraction flask is now driven off by warming after 30 c.c. of water have first been introduced. The aqueous solution is then distilled in a current of steam until all the volatile acids have passed over and the residue, after adding a few drops of phenolphthalein, is mixed with a slight excess of barium hydroxide. If after 15 minutes' warming on the water-bath the alkaline reaction is still persistent, a current of carbon dioxide is passed and the filtrate concentrated to 10 c.c. After introducing this into a 150 c.c. flask and using 40 c.c. of water for rinsing, the liquid is made up to the mark by adding 95 per cent. alcohol. One hundred c.c. of the filtrate are evaporated on the water-bath, and the residue is rinsed into a beaker, acidified with hydrochloric acid, and precipitated with sodium sulphate. From the weight of the barium sulphate, the corresponding amount of lactic acid contained in 100 c.c. of wine is readily calculated. Experiments are communicated in support of the method and to prove that the lactic acid extracted from wines is really the pure substance.

A table is given containing the amount of total acidity calculated as tartaric acid, potassium hydrogen tartrate, tartaric acid, volatile acids calculated as acetic acid, succinic acid, lactic acid, amount of c.c. of $N/2$ alkali used for neutralising 100 c.c. of wine, amount of alkali corresponding with the acids determined and alkali consumed by undetermined acids. Twenty-three samples were tested in this way, the lactic acid varying from 0.1185 to 0.4360 gram in 100 c.c.

L. DE K.

Estimation of β -Hydroxybutyric Acid in Urine. By PETER BERGELL (*Zeit. physiol. Chem.*, 1901, 33, 310—311).—The estimation of β -hydroxybutyric acid in urine may be accomplished much more readily if in the Magnus-Levy method (*Arch. exp. Path. Pharm.*, 45, 390) the dried residue from the urine is extracted with ether in a Soxhlet apparatus instead of the urine itself being extracted by shaking with ether. To obtain the dried residue, 100—300 c.c. of urine are rendered slightly alkaline with sodium carbonate and evaporated to a syrup; this is cooled, and mixed with syrupy phosphoric acid, then with 20—30 grams of finely divided and ignited copper sulphate and 20—25 grams of fine sand. J. J. S.

Detection of Citric Acid in Wine. By MATTEO SPICA (*Gazzetta*, 1901, 31, ii, 61—67).—One hundred c.c. of the wine are evaporated on the water-bath to a syrup which is extracted repeatedly with small quantities of alcohol, the liquid being filtered through a dry filter and alcoholic potassium hydroxide added in such quantity as to leave the solution faintly acid. After a few minutes, the liquid is filtered to remove the separated potassium tartrate, and then exactly neutralised with alcoholic potassium hydroxide. If citric acid is present, a white precipitate, consisting of potassium citrate and potassium hydrogen tartrate, is formed and is filtered, dried, and heated gently in a dry test-tube with a very small quantity of sulphuric acid until bubbles of gas are evolved. After cooling and diluting with water, the liquid is rendered alkaline with potassium hydroxide, the mixture being kept cold. If citric acid was present in the wine taken, the liquid now obtained contains small quantities of acetone, and on adding sodium nitroprusside, a blood-red coloration is formed, which changes to reddish-violet on adding acetic acid. In case the wine contains no citric acid, the addition of the sodium nitroprusside causes the formation of a yellowish-green coloration, due to the presence of tartaric acid. T. H. P.

Detection and Estimation of small quantities of Salicylic Acid in Wines and Foods. By HENRI PELLET (*Ann. Chim. anal. appl.*, 1901, 6, 327—328).—Two hundred c.c. of the wine are rendered alkaline and concentrated to, say, one-tenth, and the liquid is then treated by the method proposed by the author and Grobert. In this manner, 0.01 gram of salicylic acid in 100 litres of wine may be detected and estimated.

The extraction with ether is always attended with loss, the amount of which must be ascertained by testing pure samples to which a known quantity of salicylic acid has been purposely added (see following abstract). L. DE K.

Nature of the Substance giving the Ferric Chloride Reaction; Presence of Salicylic Acid in Pure Wines. By HENRI PELLET (*Ann. Chim. anal. appl.*, 1901, 6, 328—331).—Ferreira Da Silva (this vol., ii, 291) has stated that Pellet and Grobert's method for the detection of salicylic acid is not trustworthy, as it may sometimes show traces of this substance when it is absent. It now appears, however, that there is every reason to believe that the substance which gives

the reaction is really salicylic acid, or in other words, that salicylic acid is a natural constituent of some kinds of Portuguese wine. It will now be necessary to investigate this matter fully, and to arrive at a limit beyond which a sample may be pronounced adulterated.

L. DE K.

Oil of Citron. By HERBERT E. BURGESS (*Analyst*, 1901, 26, 260—262).—The author has been able to procure an undoubtedly genuine specimen of oil of citron or "essence de cedrat." The commercial article is generally oil of lemon, "essence de citron," with some verbenas. The analysis differs considerably from those obtained by other workers, as will be seen by referring to the table in the original paper.

The oil has a sp. gr. 0.8513 at 15°; n_D 1.4750 at 20°; $[\alpha]_D$ (100 mm.) +80°13'. On distilling the oil at a pressure of 10 mm., three fractions were obtained. No. 1, b. p. 60—62°, constituting 12 per cent. of the sample, had a rotation of +86°30'; No. 2, b. p. 62—64°, amounting to 80 per cent., a rotation of +85°30'; and No. 3, b. p. 64—85°, amounting to 5 per cent., a rotation of +13°30'. Nos. 1 and 2 were refractionated over sodium, and the main fraction was identified as limonene, b. p. 173—174° under atmospheric pressure. No. 3 was proved to consist of citral. This was also determined in the original sample by the sodium hydrogen sulphite and the hydroxylamine methods, which showed respectively 6.2—5.8 and 5.7 per cent. of citral.

A crystalline deposit purified by chloroform, light petroleum, and recrystallisation from alcohol gave on analysis figures corresponding with those required for the formula $C_{15}H_{18}O_6$; this substance is probably the same as that observed by Crismer and more recently by Theulier.

L. DE K.

Estimation of the Acidity in Fodder Fats. By GUSTAV LOGES and KURT MÜHLE (*Landw. Versuchs-Stat.*, 1901, 56, 95—96. Compare Emmerling, *ibid.*, 49, 45; Abstr., 1891, 770, and 1893, ii, 38).—The finely-ground substance (5 grams) was agitated with 100 c.c. of water and ether for 30 minutes in a Wagner rotatory apparatus and a portion of the filtrate titrated with alcoholic potash (made with 50 per cent. alcohol). On comparing the results with those obtained by titrating dried ether extracts of the same foods (cakes and meals), it was found, as previously, that the latter method gave much lower results. This is more especially the case with old samples, and it may, perhaps, be possible to discriminate between fresh and stored foods by determining the acidity by the two methods.

N. H. J. M.

Detection of Coconut Oil in Butter. By FERNAND RANWEZ (*Rev. Intern. Falsific.*, 1901, 14, 89—94).—A critical examination of some processes recommended of late for the detection of coconut oil in butter. Of these the only one likely to be of service is the process proposed by Vandam (*Ann. Pharm.*, 1901, 201), based on the fact that coconut oil contains a large proportion of volatile acids which are insoluble in water but soluble in rectified spirit. The process should be thoroughly investigated.

L. DE K.

Detection of Sesamé Oil in Chocolate. By GIOVANNI POSSETTO (*Chem. Centr.*, 1901, ii, 236; from *Giorn. Farm. Chim.*, 51, 241—245).—Sesamé oil is best detected by Baudouin's sugar test. To apply this to chocolate, 20—25 grams of the sample are boiled for 5 minutes with 50 c.c. of ether, and after a short time has elapsed the filtrate is evaporated to dryness and the residual fat heated for some hours to 95° in order to separate the colouring matter. The fat is then filtered whilst hot, and 5—6 grams of the clear liquid are shaken with an equal volume of a solution of sugar in hydrochloric acid. In the presence of sesamé oil, the characteristic magenta coloration makes its appearance.

L. DE K.

Estimation of Formaldehyde. By A. G. CRAIG (*J. Amer. Chem. Soc.*, 1901, 23, 638—643).—Several methods are criticised, Legler's process being finally preferred. This process, with a slight modification introduced by the author, is as follows. A quantity of the sample representing about 0.5 gram of pure formaldehyde is placed in a 3 oz. pressure bottle fitted with a soft rubber stopper, and 25 c.c. of approximately normal ammonia are added; in a similar bottle, 25 c.c. of normal ammonia only are introduced. Both are then placed up to the neck in a bath of boiling water for one hour and when cold they are carefully titrated with normal sulphuric acid, using methyl-orange as indicator. The difference between the determinations represents the formaldehyde, being 0.0601 gram for each c.c.

L. DE K.

Estimation of Formaldehyde. By ZDENĚK PEŠKA (*Chem. Zeit.*, 1901, 25, 743).—Legler's ammonia process gives good results if the excess of ammonia is carefully titrated, using litmus as indicator, the end reaction being observed by noticing the disappearance of the blue colour without getting the so-called neutral colour.

Romijn's iodometric process (*Abstr.*, 1897, ii, 166), oxidation of formaldehyde to formic acid in alkaline solution, is said to be the most satisfactory method and preferable to the one proposed by Blank and Finkenbeiner (see following abstract).

L. DE K.

Estimation of Formaldehyde. By OSKAR BLANK and HERMANN FINKENBEINER (*Chem. Zeit.*, 1901, 25, 794).—The authors call attention to their method of estimating formaldehyde by means of hydrogen peroxide (*Abstr.*, 1899, ii, 188, 820). The results agree well with those obtained by the iodometric method, and the process is easy of execution. Legler's ammonia method and the sodium hydroxide process are untrustworthy.

L. DE K.

Modification of the Sulphuric Acid Test for Formaldehyde in Milk. By A. GUSTAV LUEBERT (*J. Amer. Chem. Soc.*, 1901, 23, 682—683).—Five grams of the suspected sample of milk are distributed over 5 grams of coarsely powdered potassium sulphate contained in a 100 c.c. flask and 10 c.c. of sulphuric acid are then poured down the side of the flask. If formaldehyde is present, the potassium sulphate becomes violet in a few minutes, the colour gradually dispersing through the entire liquid, but if it is absent the liquid assumes at once a brown colour, rapidly changing to black.

By this process, 1 part of formaldehyde may be detected in 250,000 parts of milk.

L. DE K.

Detection of "Saccharin." By F. WIRTHLE (*Chem. Zeit.*, 1901, 25, 816. Compare this vol., ii, 135).—If the colour produced with ferric chloride should be a dirty brown, the liquid is acidified and again shaken with ether-petroleum mixture; this is then shaken three times with 20 c.c. of water and evaporated to dryness, when the test with ferric chloride is again applied. If there still exists a doubt, another experiment should be made as follows: 200 c.c. of wine are mixed with 40—50 drops of a 10 per cent. solution of ferric chloride and then digested on the water-bath with a slight excess of freshly precipitated calcium carbonate. The filtrate, which is now free from tannins, is tested as described; 0.5 milligram of "saccharin" may thus be detected.

L. DE K.

Detection of "Saccharin" by means of New Reactions. By MATTEO SPICA (*Gazzetta*, 1901, 31, ii, 41—46).—The author has devised two methods for the detection of small proportions of 'saccharin' in commercial products. The first of these consists in converting the imino-group of the 'saccharin' into nitric acid, which is recognised by means of diphenylamine hydrochloride, whilst in the second method the 'saccharin' is transformed into one of the sulphaminobenzoic acids which can be detected by the diazo-reaction. The method of working is as follows. The liquid to be tested, acidified with sulphuric acid, or in the case of a solid, the extract obtained with the dilute acid, is shaken in a separating funnel with ether or a mixture of ether and light petroleum, the liquid being then filtered and divided amongst three dry test-tubes which are placed in a water-bath to evaporate. The residue in one tube is tested for salicylic acid by adding nitric acid and heating gently to form picric acid, which is recognised by the method previously described (*Abstr.*, 1895, ii, 426). To the second residue is added a little lime, best somewhat granular as obtained from powdered marble, and the mixture then heated until it becomes slightly brown; a few c.c. of water are then added, the liquid heated to boiling, and the clear solution decanted off into another tube, where it is mixed with a few drops of hydrochloric acid and a small piece of zinc; after hydrogen has been evolved for 20 minutes, the liquid is again decanted off and to it are added a few drops of dilute sodium or potassium nitrite solution and 5 to 6 drops of α -naphthylamine hydrochloride solution; in the event of 'saccharin' being present in the substance examined, a crimson coloration is obtained which only appears after some hours if the quantity of 'saccharin' is very small. To the residue in the third tube are added a few drops of pure sulphuric acid and a crystal of potassium permanganate, oxidation being started by gentle heating, and the excess of permanganate removed by means of oxalic acid or sulphur dioxide. The liquid is then diluted with a few c.c. of water, a few drops of diphenylamine hydrochloride are added, and pure sulphuric acid poured carefully down the side of the test-tube so as to form a distinct layer at the bottom. The presence of nitric acid,

produced from 'saccharin,' is manifested by an azure-blue ring in the layer between the sulphuric acid and the aqueous liquid. T. H. P.

Estimation of Urea in Urine. By JOHN H. LONG (*J. Amer. Chem. Soc.*, 1901, 23, 632—638).—In order to obtain exact results with Liebig's mercuric nitrate process, allowance should be made, not only for the presence of sodium chloride, but also for the ammonia, uric acid, and creatinine. By careful analyses, the author has found that the average error due to ammonia is 1 c.c. of the mercury solution when titrating 10 c.c. of urine; uric acid is responsible for 0.15, and creatinine for 0.85 c.c.; total, 2 c.c. of mercury solution to be deducted. These figures apply only to fresh urine. L. DE K.

General Reaction of the Aromatic Amines and Hydrazines with Wood. By ERCOLE COVELLI (*Chem. Zeit.*, 1901, 25, 684).—*Amines.*—It is known that aniline gives a yellow coloration with fir wood. The author states that all aromatic amines give a reaction. The test is best applied by dissolving traces of the amines in hydrochloric acid, and moistening a shaving of fir wood. Aniline, methylaniline, *o*-toluidine, and *p*-toluidine cause a yellow colour resembling that of arsenic trisulphide. Sulphanilic acid, *o*-, *m*-, and *p*-chloroaniline, *o*- and *p*-aminophenol, phenetidine, orthoform, aminosalicilic acid, diphenylamine, *m*-phenylenediamine, *α*-naphthylamine, and *o*- and *p*-aminobenzoic acids cause an orange-yellow colour; *o*- and *m*-nitroaniline, diamminophenol, triaminophenol, *p*-nitroaniline, and *p*-phenylenediamine give an orange-red colour. When acid-groups are introduced (acetanilide, lactophenine, &c.), the wood is no longer coloured. Ammonia removes the colour.

Hydrazines.—A solution of phenylhydrazine in hydrochloric acid gives with fir wood a yellow colour which turns red and finally green after a few hours; on adding ammonia, it changes again to red, but becomes green on adding acid. This is a very characteristic reaction for phenylhydrazine.

p-Tolylhydrazine and *α*-naphthylhydrazine first give a yellow and then a red colour which turns brownish after some hours.

The active substance contained in the wood is oxidised by chlorine water; if a piece of paper containing wood-pulp is immersed for 24 hours in chlorine water, it loses its property of reacting with amino-compounds. Pyrrole, indole, and carbazole give with wood a reddish colour which disappears on moistening with ammonia. L. DE K.

Formation of Carbamide by the Oxidation of Physiological Nitrogenous Substances by means of Permanganate in Acid Solution. By W. FALTA (*Ber.*, 1901, 34, 2674—2679).—The method adopted by Jolles (*Abstr.*, 1900, ii, 636) for the oxidation of nitrogenous substances, according to which the acid solution is boiled for 10 hours and then evaporated, itself leads to the decomposition of the greater part of any carbamide present or produced in the liquid. Hippuric acid and asparagine do not yield carbamide when oxidised by permanganate in acid solution, and the substance obtained by Jolles as a product of their oxidation, and believed by him to be carbamide

oxalate, is, in reality, a mixture containing ammonium salts and compounds of manganese. Uric acid yields a certain proportion of carbamide, along with a considerable proportion of ammonia. A. H.

Behaviour of Acid Aqueous Solutions of Alkaloids [Glucosides, &c.] towards different Solvents. By HANS PROELSS (*Chem. Centr.*, 1901, 11, 236—237; from *Apoth. Zeit.*, 16, 434—435).—The following solvents were tried: ether, chloroform, ethyl acetate, benzene, and mixtures of ether or alcohol with chloroform. Of alkaloids, &c., the following were tested, 5 c.c. of an aqueous solution (1 in 500) being used. Digitalin, colchicine, picrotoxin, brucine, veratrine, strychnine, atropine, codeine, and morphine. To render the liquid acid, a few drops of dilute hydrochloric acid were added, and alkalinity was imparted by means of sodium carbonate or ammonia. It was shown that chloroform is the best general solvent. Sodium carbonate and ammonia may be used for brucine, strychnine, atropine, and codeine; ammonia should be used for veratrine and morphine. Colchicine is readily extracted from an acid solution by chloroform; digitalin from an acid solution by chloroform or chloroform-ether mixture; picrotoxin from an acid solution by ether-chloroform, alcohol-chloroform, or benzene; brucine from an alkaline solution by ether-chloroform; veratrine from a solution mixed with sodium carbonate by ether-chloroform, alcohol-chloroform, chloroform, or ethyl acetate, and from an ammoniacal solution by ether or benzene; strychnine from an alkaline solution by chloroform, alcohol-chloroform, or benzene; atropine from an alkaline solution by chloroform, alcohol-chloroform, ether-chloroform, or benzene; codeine from an alkaline solution by alcohol-chloroform, benzene, or ethyl acetate; morphine from an ammoniacal solution by ethyl acetate, and from a solution containing potassium hydrogen carbonate by alcohol-chloroform. Emulsions are mostly formed when benzene is used, and more rarely when ether or ethyl acetate is employed. L. DE K.

Resisting Power of Alkaloids, Glucosides, and Bitters to Putrefaction. By HANS PROELSS (*Chem. Centr.*, 1901, ii, 503; from *Apoth. Zeit.*, 16, 492—493).—Five hundred grams of meat and blood were mixed with 0.5 gram of mixed brucine and strychnine; mixtures were also made containing 0.5 gram of mixed morphine and strychnine, codeine, atropine, veratrine, colchicine, digitalin, picrotoxin, and finally, one with 2 grams of opium. After being exposed to the air in glass vessels for 14 days, these were put in a box which was securely nailed down and buried 20 c.m. deep in the earth. After four months and a half, the box was unearthed, the contents of each glass vessel were well mixed, and 100 grams of the material were used in the testing. The following poisons were sharply detected: strychnine, brucine, codeine, colchicine, veratrine; feebly: picrotoxin, digitalin, opium alkaloids, morphine; atropine could not be detected. After being again buried for three months and a half, another 200 grams were tested, and colchicine, brucine, veratrine, strychnine, codeine, and morphine could still be detected. Strychnine and brucine may be tested for in each other's presence, but not strychnine and morphine. That the morphine was so stable may be explained by the fact that

it had been simply mixed with the putrefying mass, whilst in previous experiments it had been introduced into the living organism; this circumstance also affects the limit of time within which other alkaloids may be recognised.

L. DE K.

Estimation of Aconitine in Preparations of Aconite. By H. ECALLE (*J. Pharm. Chim.*, 1901, [vi], 14, 97—102).—Bertrand (Abstr., 1899, ii, 456) has stated that when silicotungstic acid is added to a solution of aconitine, a precipitate is obtained of the composition $12\text{WO}_3, \text{SiO}_2, 2\text{H}_2\text{O}, 4\text{A}, n\text{H}_2\text{O}$, where A is the alkaloid. The author finds that this precipitate is better represented by the formula $12\text{WO}_3, \text{SiO}_2, 2\text{H}_2\text{O}, 3\frac{1}{2}\text{A}, n\text{H}_2\text{O}$. In order to estimate the aconitine in extract of aconite, excess of ammonia is added to a solution of the extract in dilute nitric acid, and the alkaloid removed by shaking repeatedly with ether. The ethereal solution is shaken with dilute nitric acid, the acid solution warmed to expel dissolved ether, and, when cold, treated with a solution of silicotungstic acid. The mixture is heated until it boils, and left for 24 hours; the precipitate is then collected, washed, dried, and ignited. The weight of the alkaloid is obtained by multiplying the weight of the residue, $12\text{WO}_3, \text{SiO}_2$, by 0.793. Estimations of the alkaloid in different commercial specimens of tincture and extract of aconite show that the amount is liable to great variation.

E. G.

Microchemical Reaction for Atropine. By N. SCHOORL (*Chem. Centr.*, 1901, ii, 560; from *Nederl. Tidschr. Pharm.*, 13, 208—209).—Tropine, the product of hydrolysis of atropine, yields a very characteristic hydriodide. The alkaloid is heated with a drop of aqueous sodium hydroxide, and the vapours are condensed on an object glass. A little hydrochloric acid is added, the liquid is evaporated, the residue dissolved in a drop of water, and a small particle of potassium iodide added. The tropine hydriodide thus obtained forms well defined needles and plates.

L. DE K.

Extraction of Morphine with Immiscible Solvents. By WILLIAM A. PUCKNER (*J. Amer. Chem. Soc.*, 1901, 23, 470—473).—A large number of experiments are communicated showing that morphine may be removed from a very slightly ammoniacal solution by repeated agitation with an equal volume of a mixture of 80 volumes of chloroform and 20 volumes of alcohol. If a somewhat large excess of ammonia is present, this may be neutralised by addition of sodium hydrogen carbonate. Addition of ammonium chloride is unnecessary. A solution of morphine in the slightest possible excess of sodium hydroxide yields only a little alkaloid to the alcohol-chloroform mixture, and in the presence of more alkali scarcely any of the alkaloid is extracted; on adding sodium hydrogen carbonate, the morphine is, however, liberated and rendered soluble (compare Wirthle, this vol., ii, 362).

L. DE K.

Estimation of Morphine in Opium by means of Ammoniacal Silver Chloride. By C. REICHARD (*Chem. Zeit.*, 1901, 25, 816—818).—The process is based on the fact that of the numerous

soluble constituents of opium, morphine is the only substance capable of quantitatively reducing an ammoniacal solution of silver chloride; 2 atoms of metallic silver represent 1 mol. of crystallised morphine.

A definite weight of opium powder is treated with 10–20 times its weight of boiling water and the mixture is frequently stirred for an hour. The liquid is filtered and the insoluble matter washed with hot water. To the united filtrates is now added a solution of silver chloride in ammonia and the whole is at first gently heated, although this is not strictly necessary. After a few hours, the precipitation is complete and the reduced silver is then collected on a filter and washed until the filtrate is no longer affected by ammonium sulphide. The filter is dried at 130°, burnt in a porcelain crucible, and the metallic silver weighed.

It is advisable to make another aqueous infusion and to precipitate the morphine by a judicious quantity of ammonia; the filtrate should have no reducing properties.

L. DE K.

Estimation of Nicotine in Tobacco. By JULIUS TÓTH (*Chem. Zeit.*, 1901, 25, 610. Compare this vol., ii, 203).—Experiments are communicated showing that practically no ammonia passes into the ether-petroleum mixture. Keller's proposal to remove such traces by blowing air through the liquid for one minute cannot be recommended, as this causes a slight loss of nicotine.

L. DE K.

Analysis of Tanning Materials. By GIUSEPPE SESTI (*Chem. Centr.*, 1901, ii, 745–746; from *Staz. sperim. agrar. ital.*, 1901, 34, 346–358).—Solutions containing tannin should not be filtered through paper but through asbestos, or filtration may be avoided by allowing a sufficient time for the liquid to settle. The following process is applied to the analysis of sumach. Five grams of the powder are extracted with hot water and when cold diluted to 500 c.c., or they are mixed with 500 c.c. of water and digested for 48 hours. Ten c.c. of the clear solution are then withdrawn and diluted to 400 c.c.; 10 c.c. of dilute sulphuric acid and 20 c.c. of solution of indigo-carmin are added, and the liquid titrated with *N*/20 potassium permanganate. In the meanwhile, 20 c.c. of the filtered solution are mixed with 10 c.c. of ammoniacal copper solution (22 grams of copper sulphate dissolved in 1 litre of ammonia; 1 c.c. precipitates 0.014 gram of tannin) and diluted to 200 c.c. One hundred c.c. of the filtrate are then diluted to 400 c.c. and titrated as before; the difference in c.c. of permanganate between the two titrations multiplied by 2.078 represents the percentage of tannin in the sumach.

L. DE K.

Commercial Valuation of Tanning Materials and a New Method for the Detection and Estimation of Gallic Acid in them. By MATTEO SPICA (*Gazzetta*, 1901, 31, ii, 201–208).—The author discusses the various methods proposed for the detection and estimation of gallic acid and gives the following new ones.

For detecting the acid, the material is extracted with boiling water and the solution treated in a test-tube with a slight excess of potassium plumbite; the liquid is shaken repeatedly, poured into a beaker and diluted with distilled water, which produces a more or less

intense crimson-red coloration according to the amount of gallic acid present.

To determine the proportion of gallic acid present, a weighed quantity of the material is treated with boiling water in amount sufficient to give a solution of 1—2 parts of gallic acid per 1000, and the volume of the solution measured. To 10 c.c. of the liquid are added about 5—10 c.c. of a potassium plumbite solution of sp. gr. 1.20, the solution being then either repeatedly shaken to aerate it or mixed with a few centigrams of potassium persulphate and finally made up to 100 c.c. At the same time, 10 c.c. of a solution of 1 part of gallic acid in 1000 are treated in the same way. Ten c.c. of each of the two solutions are poured into the cells of a Salleron colorimeter and compared. If the coloration is the same in the two cases, equal quantities of gallic acid are present in the two solutions. If this is not the case, water is added from a burette to the liquid which is the more intensely coloured until it has the same density of colour as the other. On reading off the amount of water added, the calculation of the percentage of gallic acid in the material taken can be readily carried out. The numbers obtained by this method are lower than those yielded by the permanganate method usually employed. T. H. P.

Estimation of Humus in Soil. By KURT BIELER and K. ASO (*Bull. Coll. Agr. Tokyo Imp. Univ.*, 1901, 4, 237—240).—Humus was determined by four different methods, (1) by combustion and multiplying the carbon result by 0.471, (2) by Knop's method, (3) by extracting successively with dilute hydrogen chloride and 3 per cent. ammonia and deducting the weight of ash from that of the ammonia residue, and (4) by Aschmann and Faber's volumetric method (*Abstr.*, 1900, ii, 60). The following amounts of humus were found by the different methods: (1) 13.84, (2) 8.85, (3) 9.79, and (4) 6.95 per cent. N. H. J. M.

The Bromination and Iodination Numbers of Proteids. By WILHELM VAUBEL (*Zeit. anal. Chem.*, 1901, 40, 470—474).—It has been shown by Blum and Vaubel (*Abstr.*, 1898, i, 287, 609) that when albumin, casein, &c., are treated with halogens, a larger quantity of the haloid acid is obtained than corresponds with the halogen which replaces hydrogen in the proteid. They therefore distinguish between the bromine (or iodine) number, and the bromination (or iodination) number, the latter being the total amount of halogen consumed, and being more easily ascertained than the former. In neither case does a single treatment complete the substitution, but for comparable results a single treatment is sufficient. With bromine, the action proceeds much further than with iodine. The process employed consisted in dissolving 2 grams of the proteid in 200 c.c. of water, adding sodium bromide, 200 c.c. of glacial acetic acid, and 20 c.c. of hydrochloric acid, and then bromate solution until an excess, persisting for 15 minutes, was shown by iodide-starch paper. Allowing 9 per cent. for the bromine consumed in substitution, the three proteids showed a further consumption, namely, egg-albumin, 35.04; blood albumin, 40.76; and casein, 27.00 parts of bromine per cent. M. J. S.

Detection of Minute Traces of Albumin in Urine. By A. PRAUM (*Chem. Centr.*, 1901, ii, 322; from *Deutsch. med. Zeit.*, 27, 220).—A few c.c. of the filtered urine are mixed with a few drops of a concentrated solution of sulphosalicylic acid, and a little more of the filtered urine is carefully poured down the sides of the test-tube. Operating in this manner, any difference in the turbidity of the two layers will be readily noticed.

L. DE K.

Sulphosalicylic Acid as a Test for Albumin. By G. ROCH (*Chem. Centr.*, 1901, ii, 445; from *Pharm. Centr.-Halle*, 42, 393).—This reagent, recently recommended by Praum (preceding abstract), has been used for a long time by the author (*Pharm. Centr.-Halle*, 30, 549). It is best prepared by warming 13 grams of salicylic acid with 20 grams of sulphuric acid and dissolving the product in 67 grams of water; the slight excess of sulphuric acid does not affect the result. By means of this test, as little as 0.0025 per cent. of albumin may be detected in urine.

L. DE K.

Detection of Peptone in Urine and Fæces. By O. FREUND (*Chem. Centr.*, 1901, ii, 505; from *Centr. inn. Med.*, 22, 647—651).—When testing for peptones in urine, it is necessary to completely remove urobilin. According to the author, this may be satisfactorily effected by adding to 10 c.c. of urine 2 or 3 drops of 20 per cent. acetic acid, 5 c.c. of 20 per cent. solution of lead acetate or basic lead acetate, boiling, and filtering. To the filtrate is then added aqueous potassium hydroxide so long as this produces a precipitate, and the liquid is again boiled and filtered. The filtrate may now be used for the biuret test. The same process applies to liquid fæces. The presence of urobilinogen does not interfere; this may, moreover, be converted into urobilin by means of iodine or nitrous acid, and then removed by lead as directed.

L. DE K.

Pancreatic Rennin and Diastase. By HORACE M. VERNON (*J. Physiol.*, 1901, 27, 174—199).—The rennin ferment in pancreatic extracts is estimated by determining the time of onset of Roberts' 'metacasein reaction,' and the diastatic by the time required for starch solution to reach the 'achromic point' when tested with iodine. The metacasein reaction depends on the rennin, not on the trypsin in the extract; it bears no relation to the tryptic power of the extract, but there is a fairly constant relationship between it and the milk curdling capacity of the extracts.

The time of onset of the two reactions mentioned varies inversely as the one-sixth power of the amount of ferment present. This proportion is, however, upset by the addition of 0.1 per cent. of sodium chloride, or by the use of tap water instead of distilled water in making the solutions of starch. The diastatic activity is increased by small quantities of acid, but is inhibited by 0.009 per cent. of hydrochloric, 0.04 per cent. of lactic, and 0.16 per cent. of acetic acid.

Extracts kept for several hours at 38° undergo loss of power on milk. The rate of destruction varies with the activity of the original solution. Hence it is concluded that rennin, like trypsin, is not a single chemical substance. The diastatic ferment is destroyed at the same rate whatever its initial activity.

W. D. H.

Absorption Spectra of the Colouring Matters of Blood. By JULIUS FORMÁNEK (*Zeit. anal. Chem.*, 1901, 40, 505—523).—The position of the bands in the absorption spectra of the blood colouring matters is indicated in the present paper by the wave-length corresponding with the maximum darkness, which is not dependent (as the positions of the edges of the bands are) on the concentration of the solution or the thickness of the layer.

Blood, simply freed from fibrin and suitably diluted, gives the two bands of oxyhæmoglobin at λ 578.1 and λ 541.7. After standing for some days exposed to air and light, a new band at λ 634, due to methæmoglobin, becomes visible: the amount of the latter substance increases with time and a feeble band at λ 500.8 is developed. If yellow ammonium sulphide or Stoke's reagent is added to the diluted blood, hæmoglobin is produced, which gives one broad band at λ 554.7 and sometimes a feeble one at λ 619.8 due to sulphohæmoglobin. When a dilute acid is added to blood the oxyhæmoglobin splits into albumin and acid hæmatin. The latter gives three bands, at λ 554.8, 517.7, and 654.2, the last visible only with strong solutions. Alkaline hæmatin, obtained by the action of concentrated potash in the cold, gives two indistinct bands at λ 582 and 546.5; after heating nearly to boiling and adding water, only a single feeble band at 580.7 can be observed, but if alcohol is added instead of water a more intense absorption, varying in position between 597.4 and 600.2 results. If the diluted blood, mixed with potassium hydroxide, is heated to 70° whilst observing with the spectroscope, an intense band at 559.1 and a feeble one at 529.2 come into view as those at 582 and 546.5 disappear: this is the spectrum of reduced hæmatin resulting from the action of a trace of potassium sulphide, produced by the decomposition of the albumin by the alkali. The same spectrum of reduced hæmatin is obtained if the alkaline blood is left for an hour or two in the cold, or when ammonium sulphide is added to either acid or alkaline hæmatin.

On adding concentrated sulphuric acid to blood and warming, hæmatoporphyrin is produced, which in acid solution gives two bands whose position varies between 553—558 and 599—604.5 respectively: the addition of a small excess of alkali produces a spectrum of four intense bands, also somewhat variable in position. If hydrogen sulphide and air are simultaneously passed through diluted blood, sulphohæmoglobin results; this gives a sharp band at 619.8. All the above colouring matters absorb the blue and violet of the spectrum to a greater or less extent.

Of the above spectra, those of reduced hæmatin and of acid hæmatoporphyrin, especially the former, are the most sensitive for the recognition of old or minute blood stains. Very old stains, in which the hæmoglobin has become insoluble, can be dissolved by potassium cyanide solution, and on adding excess of ammonium sulphide to this solution reduced hæmatin is obtained.

Observations of the spectrum of blood containing carbon monoxide show that the spectra are all compromises, the bands of carbonyl hæmoglobin, which lie nearer to the blue end than those of oxyhæmoglobin, blending with those of the latter substance to give intermediate

bands, the position of which depends on the amount of carbon monoxide absorbed.

Charts of the above spectra and a large amount of detailed information on the whole subject are given in the paper. M. J. S.

New Instrument for the Estimation of the amount of Hæmoglobin in Blood. By GUSTAV GAERTNER (*Monatsh.*, 1901, 22, 745—747).—The method depends on the fact that hæmoglobin absorbs the chemically active rays of the spectrum. The effect of light transmitted through a given thickness of blood, on a photographic plate, is inversely proportional to the amount of hæmoglobin present. The paper must be consulted for details of the apparatus.

K. J. P. O.

Hæmoglobin Crystals for the Distinction between Human and Animal Blood. By MOSER (*Chem. Centr.*, 1901, ii, 858—859; from *Vierteljahres-schr. ger. Med. öffentl. Sanitätswes.*).—The author has experimented with human blood and the blood of various animals, such as horses, sheep, calves; oxen, pigs, and rabbits. From fresh blood or stale blood, if still liquid or moist, and even from blood spots, if these have not been dry too long, hæmoglobin crystals may be obtained. The blood is, if necessary, allowed to dry on a slide, then rubbed with a little water and a few drops pressed through calico on to an object glass. After putting on the cover glass, the dried edges are examined first and should they contain crystals, the blood is sure to be of animal origin. In any case, hæmoglobin crystals will be deposited sooner or later, generally within 24 to 48 hours; those of human blood are characterised by belonging to the rhombic system and by large sharp edges and the presence of broad rectangular plates. Another conclusive fact is that the crystals of animal blood are invariably accompanied by crystals of oxyhæmoglobin.

L. DE K. 6

INDEX OF AUTHORS' NAMES.

ABSTRACTS. 1901. Parts I. & II.

(Marked A. i and A. ii respectively); and also to Transactions, 1901 (marked T.); and to Proceedings of the Session 1900—1901; Nos. 227 to 240, Nov., 1900—June, 1901 (marked P.).

COMPILED BY MARGARET D. DOUGAL.

A.

- Abegg, Richard**, and **W. Herz**, separation and identification of acids, A., ii, 190.
- Abegg, Richard**, [and **Cl. Immerwahr**], influence of the medium on the photochemical effect in silver bromide emulsions, and photochemical induction, A., ii, 217.
- Abel, Emil**, equilibrium between the different stages of oxidation of the same metal, A., ii, 376.
- electromotive relations of compounds with several oxidation stages, A., ii, 490.
- theory of the accumulator, A., ii, 537.
- Abel, John J.**, epinephrine, A., i, 354.
- Abell, Robert Duncombe**, the condensation of phenyl ethyl ketone and benzaldehyde, T., 928; P., 1901, 128.
- Aberson, J. H.** See **W. van Dam**.
- Ach, Benno.** See **Julius Tafel**.
- Ach, Narziss**, diuretic action of certain purine derivatives, A., ii, 31.
- Ackroyd, William**, researches on moorland waters. Part II. On the origin of the combined chlorine, T., 673; P., 1901, 87.
- Adam, Paul**, cell for the clinical determination of hæmoglobin in urine, A., ii, 488.
- Adamiantz, Suren.** See **Carl D. Harries**.
- Adrian, L. Alphonse**, and **J. Auguste Trillat**, pseudo-acid derived from agaric, A., i, 211.
- Adriani, J. H.**, eutectic curves in systems of three substances of which two are optical antipodes, A., ii, 230.
- Aken, Miss E. van**, oxidation of organic nitrogen compounds and the estimation of the carbon and nitrogen therein by the moist process, A., ii, 691.
- Aktien-Gesellschaft für Anilinfabrikation**, benzyl salicylate, A., i, 712.
- Akunoff, Ivan**, the chlorine-hydrogen gas cell, A., ii, 81.
- Alberda van Ekenstein, William**, new formal (methylene) compounds of hydroxy-acids, A., i, 120.
- Albert, Friedrich**, feeding experiments in 1898 and 1899, at Lauchstädt, with bullocks, pigs, and lambs, A., ii, 337.
- Albert, Robert**, simple experiment to illustrate the action of zymase, A., i, 180.
- Albitzky, Alexius**, oxidation of higher unsaturated fatty acids with sulphuric acid and ammonium persulphate, A., i, 5.
- Albo, Giacomo**, physiological significance of colchicine in different varieties of Colchicum and Merendera, A., ii, 679.
- Albrecht, E.** See **Carl Engler**.
- Alciatore, Antonio.** See **Guido Pellizzari**.
- Aldrich, T. B.**, active principle of the suprarenal gland, A., ii, 564.
- Alexéeff, Wladimir.** See **Paul Gordan**.
- Alfthan, von**, benzoyl esters and carbohydrates in normal and diabetic urine, A., ii, 179.
- Allan, F. B.**, basic nitrates of bismuth, A., ii, 318.
- Allen, Alfred Henry**, detection of arsenic in beer, A., ii, 125.
- Allison, J. R.** See **Arthur George Perkin**.
- Aloy, Jules [François]**, double chlorides of uranyl and the alkali metals; hydrochloride of uranyl chloride, A., ii, 164.

- Aloy, Jules** [*François*], new method of determining the atomic weight of uranium, A., ii, 244.
 — preparation of uranium, A., ii, 317.
- Alsberg, C.** See *P. A. Levene*.
- Altmann, Paul**, estimation of nitro-groups by a volumetric method, A., ii, 475.
- Altmann, Paul.** See also *Josef Herzig*.
- Alvisi, Ugo**, new explosive and detonating materials, V., A., ii, 498.
- Ambühl, Gottwalt**, agreement between milk solids actually determined and those found by calculation, A., ii, 137.
- Ampola, G.**, guano from Erythraea, A., ii, 341.
- Ampola, G., and C. Ulpiani**, denitrification in soil, A., ii, 524.
- André, Gustave**, chemical changes during the evolution of buds, A., ii, 120.
 — migration of nitrogenous substances and ternary substances in annual plants, A., ii, 413.
 — migration of ternary substances in annual plants, A., ii, 413.
 — basic salts containing several metallic oxides, A., ii, 509.
 — evolution of sulphur and phosphorus during the commencement of germination, A., ii, 525.
- André, Gustave.** See also *Marcellin Berthelot*.
- Andrlík, Karl, K. Urban, and V. Staněk**, molasses and similar products from sugar factories, A., ii, 287.
- Angeli, Angelo**, tetrazones, A., i, 57.
- Angeli, Angelo, and Francesco Angelico**, 3-nitroindoles, A., i, 45.
 — reactions of nitroxyl [NOH], A., i, 322.
 — new researches on nitrohydroxylaminic acid, A., ii, 381.
- Angelico, Francesco**, preparation of fulminates, A., i, 516.
- Angelico, Francesco, and E. Calvello**, 3-nitrosopyrroles, A., i, 747.
- Angelico, Francesco, and S. Fanara**, nitrohydroxylaminic acid, A., i, 707.
- Antipoff, J. A.**, analysis of bucklandite [epidote], A., ii, 607.
- Antony, Ubaldo, and Adolfo Lucchesi**, ruthenium and its compounds, A., ii, 247.
- Antony, Ubaldo, and E. di Nola**, Berthier's method of determining the calorific value of fuels, A., ii, 6.
- Apitzsch, H.**, action of nitrosoacylamines on primary bases, A., i, 138.
- Arbuckle, William.** See *Alexander Scott*.
- Arbusof, Alexander**, phenylmethylallylcarbinol, A., i, 274.
- Archangel'ski, Konstantin**, rhododendrol, rhododendrin, and andromedotoxin, A., i, 734.
- Archbutt, Leonard, and Percy George Jackson**, determination of minute quantities of arsenic in coke, A., ii, 476.
- Archibald, Ebenezer Henry.** See *Theodore William Richards*.
- Ardin-Delteil, P.**, cryoscopy of the human sweat, A., ii, 67.
- Arend, K. von.** See *August Michaelis*.
- Arlt, Ferdinand von**, dextrose, A., i, 369.
- Armsby, Henry Prentiss**, maintenance ration of cattle, A., ii, 271.
- Armstrong, Edward Frankland.** See *Emil Fischer*.
- Armstrong, Henry Edward, and T. M. Lowry**, stereoisomeric α - and α' -sulphonic derivatives of camphor, P., 1901, 182.
- Armstrong, Henry Edward, and Leonard Philip Wilson**, 1 : 2 : 4-*m*-xyldine-6-sulphonic acid, P., 1900, 229.
- Arndt, Kurt**, barium nitrite, A., ii, 507.
- Arnold, Carl, and F. Murach**, detection of nitrogen in arsenic, &c., A., ii, 236.
- Arnold, W.** See *Albert Edinger*.
- Aronson, Hans**, biology and chemistry of diphtheria bacilli, A., ii, 265.
- Arrhenius, Svante**, calculation of degree of dissociation of strong electrolytes, A., ii, 144, 435.
- Arth, Georges**, commercial hydrogen peroxide, A., ii, 622.
- Artini, Ettore**, new mineral species found in Baveno granite, A., ii, 664.
- Aschan, [Adolf] Ossian**, constitution of camphor, A., i, 477.
- Ascoli, Alberto**, the phosphorus of nucleins, A., i, 108.
 — a new decomposition product of yeast nuclein, A., i, 108.
- Asher, Leon, and Frederic W. Busch**, properties and origin of lymph, A., ii, 29.
- Asher, Leon, and William D. Cutter**, physiology of glands, A., ii, 176.
- Asher, Leon, and Holmes C. Jackson**, formation of lactic acid in the blood, A., ii, 563.
- Asō, K.**, rôle of oxydase in the preparation of commercial black tea, A., ii, 679.
- Asō, K.** See also *Kurt Bieler*.
- Astachoff, A., and Sergius N. Reformat'sky**, synthesis of α -methyl- β -ethylhydraerylic acid, A., i, 447.
- Aston, Bernard Crocroft.** See *Thomas Hill Easterfield*.
- Aston, Francis W.** See *Percy Faraday Frankland*.

Aston, Henry. See *Percy Faraday Frankland*.
Astruc, A., action of vegetable alkaloids on certain indicators, A., i, 604.
 — distribution of acidity in stems, leaves, and flowers, A., ii, 677.
Astruc, A., and **H. Murco**, acidimetry of aldehydes and ketones, A., i, 66.
 — — derivatives of cacodylic acid, A., i, 144.
Astruc, A., and **J. Tarbouriech**, acidimetry of arsenic acid, A., ii, 552.
Atkinson, Edmund, obituary notice of, T., 872, 888.
Atkinson, Ernest. See *Carl D. Harries*.
Atterberg, Albert, variations in the amounts of nutritive substances in oats, A., ii, 573.
Atwater, Wiebur Olin, and **Francis Gano Benedict**, digestion of food by man, A., ii, 253.
Atwater, Wiebur Olin, and **C. S. Phelps**, study of rations fed to milch cows in Connecticut, A., ii, 337.
Aubel, Edmund van, thermoelectric behaviour of some oxides and metallic sulphides, A., ii, 222.
 — molecular heats of compounds and the law of Neumann-Joule-Kopp, A., ii, 226.
 — density of alloys, A., ii, 453.
Auchy, George, estimation of sulphur in wrought iron and steel, A., ii, 420.
Aue, W. See *Alfred Wohl*.
Auer, John. See *Walter Jones*.
Auerbach, Gustav, electrolysis of molten lead iodide and lead chloride with particular reference to the application of Faraday's law and the theory of the electrolysis of molten salts, A., ii, 590.
Auerbach, Martin, and **Richard Wolfenstein**, action of hydrogen peroxide on tertiary bases, III., A., i, 613.
Auger, Victor, manganic phosphates, A., ii, 554.
Autenrieth, Wilhelm, and **R. Hennings**, ring compounds containing sulphur, A., i, 560.
Autenrieth, Wilhelm, [and, in part, **J. Koberger**, and **Paul Spiess**], simple and mixed acid anhydrides, A., i, 185.
Autenrieth, Wilhelm, and **Paul Spiess**, crotonic and isocrotonic acids, A., i, 199.
 — — a simple means of obtaining secondary symmetrical hydrazines, A., i, 230.
Avery, Samuel, and **H. T. Beans**, soluble arsenious oxide in Paris green, A., ii, 346.
 — — rapid estimation of arsenious oxide in Paris green, A., ii, 623.

Aweng, Eugen, active glucosides soluble in water contained in *Frangula*, *Sagrada*, and *rhubarb*, A., i, 39.

B.

Babcock, S. Moulton, H. L. Russell, and **Alfred Vivian**, properties of galactase, a digestive ferment of milk, A., i, 437.
 — — distribution of galactase in different species of Mammalia, A., ii, 406.
 — — distribution of galactase in cow's milk, A., ii, 406.
Bach, A., higher hydrogen peroxides, A., ii, 14.
 — action of anhydrous sulphuric acid on dry potassium persulphate, A., ii, 447.
Bach, Hermann, action of aldehydo-collidine [2-methyl-5-ethylpyridine] on substituted aromatic aldehydes; phenyl- α -picolylalkine [2- β -hydroxy- β -phenylethylpyridine], A., i, 609.
Bachér, Fr. See *Adolph Emmerling*.
Bachtschéeff, N. See *Iwan L. Kondakoff*.
Backe, P., action of cuminaldehyde on α -picoline (2-methylpyridine), A., i, 562.
Backhaus, and R. Braun, milk proteid as food, A., ii, 529.
Badische Anilin- and Soda-Fabrik, transformation of hydroxynaphthalene derivatives into the corresponding amines, A., i, 695.
 — 8-hydroxy- α -naphthylamine-4-sulphonic acid, A., i, 699.
 — condensation of indigo-white with formaldehyde, A., i, 715.
 — preparation of 2:4-dihydroxyquinoline, A., i, 751.
 — preparation of acridine colouring matters by means of benzaldehyde, A., i, 753.
 — *p*-dihydroxydiphenyl-4:6-dinitro-1:3-phenylenediamine, A., i, 755.
 — nitro-*m*-phenylenediaminesulphonic acid, A., i, 755.
Bäcker, Karl, dielectric constant of some gases and vapours and its dependence on temperature, A., ii, 220.
Baeyer, Adolf von, systematisation and nomenclature of dicyclic compounds, A., i, 135.
Baeyer, Adolf von, and **Otto Seuffert**, exhaustive bromination of menthone, A., i, 216.
Baeyer, Adolf von, and **Victor Villiger**, diethyl peroxide, A., i, 62.
 — — ethyl hydroperoxide, A., i, 308.
 — — nitrous acid, A., i, 309.

- Baeyer, Adolf von, and Victor Villiger**, peracids and peroxide acids, derived from dibasic organic acids, A., i, 326.
- basic properties of oxygen, A., i, 658.
- hydrate of sulphuryl chloride, A., ii, 311.
- action of hydrogen peroxide on silver oxide, A., ii, 315, 654.
- permonosulphuric acid (Caro's acid), A., ii, 380.
- Bagley, Ernest, and Harry Brearley**, Schöffel's process for estimating tungsten in steel, A., ii, 200.
- Bailhache, G.**, new crystallised molybdenum sulphate, A., ii, 243.
- Baker, T. J.**, thermochemistry of the alloys of copper and zinc, A., ii, 303.
- Bakker, G.**, theory of the capillary layer between the homogeneous phases of liquid and vapour, A., ii, 88, 374.
- Bakunin, Marussia**, hydroxyphenyleinamic acid, A., i, 84.
- synthesis and products of dehydration of unsaturated acids, A., i, 710.
- Balchowsky, Dimitri**, separation of cobalt and nickel by electrolysis, A., ii, 533.
- Balbiano, Luigi**, bromofenchone, A., i, 89.
- a new glycine anhydride, A., i, 454.
- Baldi, Silvio**. See *Ililio Guareschi*.
- Baldwin, E. R., and P. A. Levene**, action of proteolytic enzymes on toxins, A., ii, 667.
- Balland, Voandzia subterranea**, A., ii, 415.
- composition and nutritive value of the principal vegetables, A., ii, 572.
- Baly, Edward C. Cyril, and H. W. Syers**, spectrum of cyanogen, A., ii, 633.
- Bamberger, Eugen**, isomeric change of azoxybenzene, A., i, 107.
- action of diazobenzene on phenol and synthesis of *o*-hydroxyazobenzene, A., i, 107.
- mechanism of the conversion of arylhydroxylamines into aminophenols, A., i, 140, 203.
- action of nitrosobenzene on aromatic hydrazines, A., i, 171.
- Bamberger, Eugen, and Friedrich Brady**, 2 : 4-dimethylphenylhydroxylamine and 2 : 4-dimethyl- ψ -quinol, A., i, 142.
- Bamberger, Eugen, and Ed. Demuth**, nitration of mesitylenic acid, A., i, 209.
- *o*-aminobenzaldoximes, A., i, 391.
- Bamberger, Eugen, and Ed. Demuth**, synthesis of *o*-azidobenzaldehyde [*o*-triazobenzaldehyde], A., i, 621.
- Bamberger, Eugen, and Jacob Grob**, action of phenylhydrazine on phenanthraquinone, A., i, 280.
- acetylamidrazone, A., i, 292.
- action of sodium methoxide on phenylnitroformaldehydephenylhydrazone, and the oxidation of benzaldehydephenylhydrazone, A., i, 296.
- benzaldehydephenylhydrazone, A., i, 567.
- Bamberger, Eugen, and Paul de Gruyter**, formazyl methyl ketone, A., i, 778.
- Bamberger, Eugen, and Paul Leyden**, dimethylaniline oxide, A., i, 200.
- Bamberger, Eugen, and Jens Müller**, action of diazobenzene on some aliphatic aldehydes and ketones, A., i, 778.
- Bamberger, Eugen, and Adolf Rising**, mesitylhydroxylamine and nitrosomesitylene, A., i, 141.
- mesityl- ψ -quinol, A., i, 142.
- action of toluene-*p*-sulphinic acid on nitrosobenzene, A., i, 201.
- action of *p*-tolylsulphinic acid on β -phenylhydroxylamine, A., i, 202.
- action of methyl on the velocity of reaction of the β -aromatic hydroxylamines, A., i, 529.
- 1 : 3-xylyl-2-hydroxylamine and 2-nitroso-1 : 3-xylene, A., i, 531.
- Bamberger, Eugen, and Ernst Rüst**, isodiazotisation of arylamines, A., i, 171.
- Bamberger, Eugen, and Thor Scheutz**, oxidation of benzylamine, A., i, 587.
- Bamberger, Eugen, and Thor Scheutz**, [in part with *R. Seligmann*], oxidation of aromatic and aliphatic aldoximes, A., i, 548.
- Bamberger, Eugen, and Otto Schmidt**, nitroformaldehydephenylhydrazone, A., i, 291.
- isomeric hydrazones, A., i, 565.
- Bamberger, Eugen, and Bogdan Szolayski**, action of air and water on β -benzylhydroxylamine, A., i, 84.
- Bamberger, Max, and Arthur Praetorius**, auto-oxidation products of anthragallol, A., i, 730.
- Bamberger, Max, and Emil Vischner**, natural resins [Ueberwallungsharze], VII., A., i, 220.
- Bancels, Larguier des**. See *Victor Henri*.
- Bancroft, Wilder Dwight**, reaction velocity and equilibrium, A., ii, 88.
- reaction velocity and solubility, A., ii, 150.

- Bancroft, Wilder Dwight**, laboratory apparatus for decomposition voltages, A., ii, 302.
 — dissociation studies, II., A., ii, 307.
- Bandrowski, Ernst**, action of concentrated nitric acid on bromobenzene, A., i, 21.
 — action of bromonitrobenzenes on *p*-phenylenediamine, A., i, 48.
- Bang, Ivar**, nucleo-histon, A., i, 57, 299.
 — guanylic acid, A., i, 299.
 — proteids, A., i, 490.
 — physiological action of guanylic acid, A., ii, 408.
- Barbier, Philippe**, myrcenol and its constitution, A., i, 477.
 — constitution of licareol (linalool), A., i, 731.
- Barbier, Philippe**. See also **Durand, Huguenin & Co.**
- Barbieri, N. Alberto**, [proximate composition of] nervous tissue, A., ii, 613.
- Barbour, William**. See **Thomas Purdie**.
- Barche, Gregoire**. See **Friedrich Kehrmann**.
- Barcroft, Joseph**, gaseous metabolism of the submaxillary gland. II. Absorption of water, A., ii, 28.
 — gaseous metabolism of the submaxillary gland, A., ii, 609.
- Bardach, Bruno**, detection of mercury in urine, A., ii, 579.
- Barendrecht, H. P.**, agglutination of yeast, A., ii, 677.
- Bargellini, G.** See **Emilio Gabutti**.
- Barnes, Bayard**. See **Henry Lord Wheeler**.
- Barnes, James**, depression of the freezing point in solutions containing hydrochloric and sulphuric acids, A., ii, 304.
 — relation of the viscosity of mixtures of solutions of certain salts to their state of ionisation, A., ii, 374.
- Barral, Étienne**, a general method for the preparation of mixed phenyl alkyl carbonates; pentachlorophenyl alkyl carbonates, A., i, 28.
 — analysis of the mineral water of the Cévennes spring at Ucel (Ardèche), A., ii, 252.
- Barral, Étienne**, and **L. Jambon**, preparation of pentachlorophenol, A., i, 27.
- Barschall, Hermann**. See **Franz Sachs**.
- Barth, Georg**, bitter principles of hops, A., i, 40.
 — commercial preparations of diastase, A., i, 437.
- Barth, Max**, manurial experiments with hops, A., ii, 72.
- Barthe, Léonce**, and **R. Péry**, elimination and toxicological detection of cacodylic acid, A., ii, 364.
- Bartolotti, Pietro**, derivatives of benzophenone, V. and VI., A., i, 36.
- Bartsch, P.** See **Richard Stoermer**.
- Basch, E. E.**, artificial preparation of polyhalite, A., ii, 168.
- Basler Chemische Fabrik**, chloroiodo-hydroxyquinoline, A., i, 750.
- Bassani, Vittorio**. See **Felice Garelli**.
- Bataillon, E.**, comparative value of saline and saccharine solutions in experimental teratogenesis, A., ii, 401.
- Batschinski, Alexius**, relation between viscosity and some other physical constants, A., ii, 438.
 — Maxwell's law $K=n^2$ in reference to the molecular structure of substances, A., ii, 595.
 — relationship of viscosity of liquids to temperature and chemical constitution, A., ii, 645.
- Battandier, J. A.**, large yield of manna by olive trees, A., ii, 268.
- Baud, Achille**, rapid estimation of fatty acids in soaps, A., ii, 358.
- Baud, Achille**. See also **Philippe A. Guey**.
- Baud, E.**, combination of aluminium chloride with ammonia, A., ii, 161.
 — thermochemical study of the ammonio-aluminium chlorides, A., ii, 224.
 — dissociation and thermochemistry of the compound $Al_2Cl_6, 18NH_3$, A., ii, 303.
- Bauer, R.** See **Franz Kunckell**.
- Baum, Erich**, pyromucic anhydride, A., i, 735.
- Baumert, Georg**, and **H. Bode**, [with **A. Fest**], estimation of the true percentage of starch in potatoes, A., ii, 44.
- Baur, E.**, synthetical formation of ammonia, A., ii, 550.
- Baur, E.**, and **R. Marc**, luminescence spectra of the rare earths, A., ii, 634.
- Bausor, Harold W.** See **Siegfried Ruhemann**.
- Baxandall, F. E.** See **Sir Joseph Norman Lockyer**.
- Bayer, F., & Co.** See **Farbenfabriken vorm. F. Bayer & Co.**
- Baylac, J.**, composition of oedema-fluid, A., ii, 566.
- Bayley, Thomas**, cobalt peroxide, A., ii, 162.
 — relations between atomic weight, atomic volume, and melting point, A., ii, 497.
- Bayliss, William M.**, action of carbon dioxide on blood vessels, A., ii, 404.
- Bayrac, Pierre Henri**, and **Charles Camichel**, absorption of light by indophenols, A., i, 296.

- Bayrac, Pierre Henri.** See also *Charles Camichel*.
- Beans, H. T.** See *Samuel Avery*.
- Beardsley, H. P.** See *Horace Lemuel Wells*.
- Beauverie, J.**, effect of osmotic pressure on the form and structure of plants, A., ii, 183.
- Bebie, J.** See *Georg Lunge*.
- Beckmann, Ernst [Otto]**, lamps for spectra, A., ii, 53, 81.
- Beckstroem, R.** See *Hermann Thoms*.
- Beckurts, Heinrich.** See *Gustav Friedrichs*.
- Bequerel, [Antoine] Henri**, secondary radio-activity of metals, A., ii, 215.
- Beddies, Alfred**, nitrification and denitrification, A., ii, 569.
- Beeck-Vollenhoven, van.** See *Otto Wallach*.
- Beger, C.**, nitrogenous compounds in molluscs, A., ii, 272.
- Béhal, Auguste**, action of organometallic derivatives on alkyl esters, A., i, 246.
— ketones of wood oil; dimethylcyclohexenone, A., i, 278.
- Béhal, Auguste**, and *C. Phisalix*, quinone as the active principle of the venom of *Iulus terrestris*, A., ii, 69.
- Béhal, Auguste**, and *Tiffeneau*, an isomeride of anethole and the constitution of the latter compound, A., i, 272.
- Behn, K.** See *Richard Stoermer*.
- Behn, U.**, density of carbon dioxide in the solid and liquid state, A., ii, 95.
- Behr, G. E.** See *Charles Loring Jackson*.
- Behrend, Paul**, and *H. Wolfs*, estimation of the true amount of starch in potatoes, A., ii, 536.
- Behrend, Robert, Ferdinand C. Meyer**, and *Yngve Buchholz*, ethyl β -aminocrotonate, A., i, 136.
- Behrend, Robert.** See also *Paul Koech*.
- Behrens, Theodor Heinrich**, microchemical distinction of the hydrocarbons of coal tar, A., ii, 351.
- Beijerinck.** See *Beyerinck*.
- Beilby, George Thomas**, and *George Gerald Henderson*, the action of ammonia on metals at high temperatures, T., 1245; P., 1901, 190.
- Beistle, C. P.** See *C. A. Browne, jun.*
- Beitter, Albert**, *Catha edulis*, A., ii, 268.
- Bell, Chichester A.**, a calibrating mercury pipette, P., 1901, 179.
- Bellier, J.**, detection and estimation of "dulcin" (phenetolecarbamide) in articles of food, A., ii, 50.
— a new artificial colouring matter in wine and the detection of orehil, cochineal, phytolacca, and beet-root red in wine, A., ii, 210.
- Bellocq, A.**, detection of lead in drinking waters, A., ii, 349.
- Bellucci, I.** See *Arturo Miolati*.
- Bement, A.**, improvement in Orsat's apparatus, A., ii, 342.
- Bemmelen, Jacobus Martinus van**, [and *G. M. Rutten*], the system $\text{Bi}_2\text{O}_3\text{—N}_2\text{O}_5\text{—H}_2\text{O}$, A., ii, 24.
- Bénard, H.** See *L. J. Simon*.
- Bendix, Ernst**, quantity of sugar formed in the animal organism after feeding with various proteids, A., ii, 258.
— chemistry of Bacteria, A., ii, 266.
— sugar formation after administration of proteids, A., ii, 563.
- Bénech, Elophe**, and *Fr. Kutscher*, oxidation of arginine, I., A., i, 403.
- Benedicks, Carl**, does a law corresponding with that of Avogadro hold for the solid state? Hardness of metals and alloys, A., ii, 374.
- Benedict, Francis Gano.** See *Wicbur Olin Atwater*.
- Beneker, Jay C.** See *Joseph W. Ellms*.
- Bennett, C. T.**, estimation of mercury in ammoniated mercury and other mercury compounds, A., ii, 131.
- Bennett, J. Cora.** See *Emil Joseph Constanam*.
- Benoist, Louis**, laws of transparency of matter for X-rays, A., ii, 215.
— determination of atomic weights, based on the laws of the transparency of matter for X-rays: atomic weight of indium, A., ii, 308.
- Berg, Hans von.** See *Hermann Pauly*.
- Bergell, Peter**, estimation of β -hydroxybutyric acid in urine, A., ii, 701.
- Berju, Georg**, chemical examination of soil, A., ii, 193.
- Berliner, Ernst.** See *Hans Jahn*.
- Bernard, A.**, estimation of sugar in vinous products, A., ii, 355.
- Berndt, G.**, band spectra of alumina and nitrogen, A., ii, 367.
- Bernoulli, A.**, and *E. Grether*, ammonia nickel cyanide, A., i, 584.
- Bernstein, J.**, experimental contribution to the theory of the drop electrode, A., ii, 636.
- Berry, Albert E.**, the effect on the Marsh test of some commercial products containing selenium and tellurium, A., ii, 423.
- Bersch, Wilhelm.** See *Emerich Meissl*.
- Bertarelli, E.**, adulteration of roasted coffee by means of addition of water and borax, A., ii, 195.
- Berthelm, Alfred**, the fluorescent compound derived from ethyl 2-chloro- α -naphthaquinone-3-acetoacetate, A., i, 467.

- Berthelot, Daniel**, a property of monatomic gases, A., ii, 639.
- Berthelot, Mareellin** [*Pierre Eugène*], action of alkali sulphides on potassium ferrocyanide, A., i, 20.
- isomerism of thiocyanic esters, A., i, 203.
- generation of hydrocarbons by metallic carbides, A., i, 245.
- complete synthesis of acetylpropylene [pentinene] and of terpilene hydrocarbons, A., i, 247.
- action of cuprous salts on hydrocarbons and carbon monoxide, A., i, 493; ii, 505.
- acetylenoid metallic radicles, A., i, 494.
- chemical actions caused by the silent electric discharge and the conditions under which they take place, A., ii, 2.
- distinction between physical and chemical supersaturation of liquids by gases, A., ii, 8.
- action of the silent electric discharge on sulphur perfluoride, A., ii, 15.
- formation of nitric acid during combustions, A., ii, 17.
- reactions of oxygen and carbon monoxide in the presence of alkalis, A., ii, 17.
- slow action of hydrogen bromide on glass, A., ii, 19.
- Egyptian gold, A., ii, 25.
- combination of silver and oxygen, A., ii, 97.
- carbon monoxide and silver, A., ii, 97.
- hydrogen and silver, A., ii, 97.
- heat of formation of mercaptans and alkyl sulphides, A., ii, 146.
- allotropic modifications of silver, A., ii, 156.
- compounds of silver and mercury, A., ii, 156.
- dissolution of solid metals in mercury, and more generally in other fused metals, A., ii, 241.
- electrochemical relations between the allotropic states of metals, and especially of silver, A., ii, 301.
- presence of platinum amongst the characters of a hieroglyphic inscription, A., ii, 318.
- new researches on the action of hydrogen peroxide on silver oxide, A., ii, 383.
- slow alteration in copper alloys in contact with air and alkali chlorides, A., ii, 386.
- heat of rapid combustion of aluminium, A., ii, 388.
- Berthelot, Mareellin** [*Pierre Eugène*], methods for determining the limits of olfactory sensibility, A., ii, 406.
- reduction of silver chloride by hydrogen and the inverse reaction, A., ii, 448.
- titration of acids and alkalis of complex function, A., ii, 497.
- neutralisation of phosphoric acid, A., ii, 502.
- formation of insoluble phosphates by double decomposition: disodium phosphate and silver nitrate, A., ii, 503.
- reactions of two basic oxides exposed simultaneously to the action of phosphoric acid, A., ii, 504.
- action of cuprous salts on carbon monoxide, A., ii, 505.
- gold and silver alloys and other materials obtained from Egyptian tombs, A., ii, 514.
- metals of ancient Egypt: study of a metallic sheath and its inscriptions, A., ii, 515.
- chemical equilibria; phosphoric acid and chlorides of the alkaline earths, A., ii, 551.
- acidity of some animal excretions, A., ii, 610.
- practical methods for the rapid spectroscopic analysis of gases, A., ii, 684.
- analysis of gases by means of the electric spark, A., ii, 685.
- Berthelot, Mareellin**, and **Gustave André**, formation of acids in plants, A., ii, 677.
- Berthold, Adolf**, recovery of platinum from platinum residues, A., ii, 557.
- Bertini, Corrado**, condensation products of ethyl cyanoacetate with aldehydes, A., i, 537.
- action of sodium and of hydroxylamine on ethyl cyanoacetate phenylhydrazone and the synthesis of ethyl cyano-oxalacetate, A., i, 775.
- Bertolo, P.**, artemisin, A., i, 718.
- Bertrand, Gabriel**, chemical composition of the coffee of Grande Comore, A., ii, 185.
- Bertrand, Gabriel**, and **R. Sazerac**, biochemical differentiation of the two principal vinegar ferments, A., ii, 523.
- Bertrand, Gabriel**. See also **Léon Maquenne**.
- Bertsch, Ernst**. See **Roland Scholl**.
- Besson, [Jules] Adolphe**, preparation of phosphorus suboxide, A., ii, 502.
- Besthorn, Emil**, and **E. Garben**, action of ethyl acetonedicarboxylate on aniline, A., i, 78.

- Besthorn, Emil**, and *E. Garben*, action of ethyl acetonedicarboxylate on *m*-phenylenediamine, A., i, 97.
- Betti, Mario**, condensation between β -naphthol, aldehydes, and amines, A., i, 81, 611, 753.
- Betti, Mario**, [and, in part, *Giovanni Leoncini*], unstable isomerides of the azo-derivatives of β -naphthol, A., i, 55.
- Betti, Mario**, [with *Cesare Speroni*], addition of aldehydoaminic bases to naphthols, A., i, 81, 778.
- Bettink, Hendrik Wefers**, nitrites in milk, A., ii, 422.
- Bevan, Edward John**. See *Charles Frederick Cross*, and *Arthur George Green*.
- Bevier, Isabel**. See *Harry S. Grindley*.
- Beyerinck, Martinus Willem**, formation of hydrogen sulphide in sewers, and the new genus *aërobacter*, A., ii, 119.
- experiments with bacteria decomposing carbamide, with the object of the accumulation of one variety. Decomposition of carbamide by urease, and by katabolism, A., ii, 264.
- photobacteria as a reactive in the investigation of the chlorophyll function, A., ii, 523.
- oligonitrophilous microbes, A., ii, 523.
- Beykirch, Joseph**, strontianite from Münster-land, A., ii, 247.
- Beythien, Adolf**, chemical composition and nutritive value of different kinds of meat, A., ii, 177.
- Beythien, Adolf**, and *Paul Bohrish*, brandy flavouring essences, A., ii, 285.
- Beythien, Adolf**, and *Hans Hempel*, chocolate-flour, A., ii, 288.
- Bial, Manfred**, sugar formation and enzymic action in liver cells, A., ii, 608.
- Bidet, Felix**, action of ammonia on amine hydrochlorides, A., i, 634.
- Bielecki, Jean**. See *Fritz Ullmann*.
- Bieler, Kurt**, and *K. Asō*, assimilation of nitrogen and phosphoric acid at three periods of growth, A., ii, 682.
- estimation of humus in soil, A., ii, 709.
- Biefeld, P.**, amylolytic action of saliva, A., ii, 561.
- Bienenthal, Alexander**, action of α -chlorohydrin on some tertiary amines, A., i, 128.
- Bierry**. See *P. Portier*.
- Bigelow, W. D.** See *L. M. Tolman*.
- Biginelli, Pietro**, arsenical gas from wallpaper, A., i, 20.
- Billmann, Adolf**. See *Paul Rabe*.
- Biltéryst**, differentiation between albumins, syntonins, albumoses, and peptones of muscular tissue, A., ii, 632.
- Biltz, Heinrich**, dissociation of the sulphur molecule, S₈, A., ii, 649.
- Bindemann, Willi**. See *Wilhelm Wislicenus*.
- Bindewald, H.** See *August Michaelis*.
- Binet, Maurice**. See *Albert Robin*.
- Binz, Arthur**, reduction of indigotin in an anhydrous medium, A., i, 593.
- Bird, F. C. J.**, assay of *nux vomica*, A., ii, 140.
- Gutzeit's test for arsenic, A., ii, 576.
- Biron, Eugen von**, hydrolysis of ethyl nitrate by water, A., i, 111.
- action of ethyl iodide on silver nitrate, A., i, 111.
- Bisbee, Harold**. See *Theodore William Richards*.
- Bischoff, Carl Adam**, [and, in part, with *J. Bloch*, *S. Gerbert*, *F. Mitt*, *A. Pessis*, and *S. Werschow*], formation of chains. LV. Derivatives of phenoxyacetamide and anilide, A., i, 524.
- Bischoff, Carl Adam**, [and, in part, *J. Bloch*, *A. Pessis*, and *S. Werschow*], formation of chains. LVIII. Reaction of sodium phenoxide with derivatives of α -bromo-fatty acids and methyl- and ethyl-aniline, A., i, 526.
- Bischoff, Carl Adam**, [and, in part, *P. Denissenko*, *S. Gerbert*, *W. Kissin*, and *F. Mitt*], formation of chains. LIX. Reaction of sodium phenoxide with derivatives of α -bromo-fatty acids and benzaniline, diphenylamine, and carbazole, A., i, 527.
- Bischoff, Carl Adam**, [with *J. Feigin*, *S. Gerbert*, *N. Goldblatt*, *L. Konkoro-witsch*, *J. Liebermann*, and *P. Meschlumjanz*], formation of chains. LVI. Toluidides and naphthalides of phenoxy-fatty acids, A., i, 524.
- Bischoff, Carl Adam**, [and, in part, with *S. Gerbert*, *S. Hirschfeld*, *K. Krause*, *F. Mitt*, and *A. Watschjanz*], formation of chains. LVII. Nitroanilides of phenoxy-fatty acids, A., i, 525.
- Bistrzycki, Augustin**, and *Carl Herbst*, aliphatic- γ - and aromatic-*o*-aldehydoacids, A., i, 386.
- *p*-hydroxytriphenylecarbinol, A., i, 701.
- Bistrzycki, Augustin**, and *Leon Nowakowski*, condensation of benzilic acid with phenols, A., i, 716.
- Bistrzycki, Augustin**, and *Erwin Stelling*, behaviour of bromine towards the unsaturated condensation products from benzyl cyanide and the substituted benzaldehydes, A., i, 718.

- Bistrzycki, Augustin**, and **K. Wehrbein**, synthesis of tertiary aromatic acids, A., i, 712.
- Bizzell, J. A.** See **George S. Fraps**.
- Black, Otis Fisher.** See **Joseph Torrey, jun.**
- Blackler, M. Bennett**, preparation of dimethyl sulphate, A., i, 577.
- Blair, Andrew A.**, estimation of carbon in ferrochrome, A., ii, 74.
- Blaise, Edmond E.**, new reactions of organometallic derivatives, A., i, 133.
- new reactions of organometallic derivatives. II. Alkyl esters of α -alkyl- β -ketonic acids, A., i, 252.
- ethereal derivatives of the organometallic compounds, A., i, 317.
- new reactions of organometallic derivatives. III. Unsubstituted β -ketonic esters, A., i, 363.
- Blanc, Edouard.** See **Alphonse Seyewetz**.
- Blanc, Georges**, constitution of camphoric acid, and the migrations which take place in its molecule, A., i, 10.
- attempted synthesis of $\alpha\beta$ -trimethylglutaric acid, A., i, 119.
- Blanc, Georges.** See also **Albin Haller**.
- Blanchard, A. A.** See **Arthur Amos Noyes**.
- Blanchard, W. M.** See **William Albert Noyes**.
- Blank, Oskar**, and **Hermann Finkenbeiner**, estimation of formaldehyde, A., ii, 703.
- Blanksma, J. J.**, organic polysulphides and the polysulphides of sodium, A., i, 264.
- substitutions and transformations effected by sodium disulphide, A., i, 460.
- reducing action of sodium disulphide; preparation of di-*m*-nitroazoxybenzene and of di-*p*-nitroazobenzene, A., i, 461.
- formation of organic tri- and tetrasulphides, A., i, 462.
- Blanksma, J. J.** See also **Cornelis A. Lobry de Bruyn**.
- Blasdale, W. C.**, heptane from coniferous trees, A., i, 357.
- Bleibtren, Max**, respiratory quotient in geese, A., ii, 457.
- Blix, Martin.** See **Alfred Stock**.
- Bloch, J.** See **Carl Adam Bischoff**.
- Bloxam, William Popplewell**, the ammonium sulphate method of separating the proteids of horse-serum, A., ii, 404.
- Blum, Fritz**, [thyreo-globulin], A., ii, 671.
- Blum, H.** See **Emilio Nölting**.
- Bluman, N. J.** See **Arthur Bower Griffiths**.
- Blumenthal, Ferdinand**, and **Carl Neuberger**, formation of acetone from albumin, A., i, 433.
- Blumenthal, Ferdinand**, and **Julius Wohlgemuth**, glycogen formation after proteid feeding, A., ii, 610.
- Blyth, Meredith Wynter**, detection and estimation of preservatives in milk, A., ii, 483.
- Bode, Adolf.** See **Richard Willstätter**.
- Bode, H.** See **Georg Baumert**.
- Bodin, E.**, and **C. Lenormand**, production of casease by a parasitic Streptothrix, A., i, 624.
- Bodländer, Guido**, and **P. Breull**, theory of technical processes, A., ii, 383.
- Bodman, Gäste**, isomorphism between the salts of bismuth and the rare earths, A., ii, 454.
- Bodroux, F.**, formation and preparation of propylbenzene, A., i, 196.
- hexyl bromide, A., i, 306.
- action of ethylidene chloride and methylene chloride on naphthalene in presence of aluminium chloride, A., i, 374.
- constitution of a bromo-derivative of isobutylbenzene, A., i, 519.
- action of isobutylene dibromide on benzene in the presence of aluminium chloride, A., i, 523.
- action of bromine on carvacrol in the presence of aluminium bromide, A., i, 697.
- Boedtker, Eyvind**, oxidation of homologues of benzene, A., i, 684.
- Boehm, Carl.** See **Hermann Pauly**.
- Boehringer, C. F., & Sons**, electrolytic reduction of nitro-compounds to amines, A., i, 684.
- preparation of *p*-aminophenylglyoxylic acid and its homologues, and substitution products, A., i, 713.
- *p*-aminophenylglyoxylic acid and its derivatives, A., i, 714.
- 3-alkylxanthine derivatives, A., i, 770.
- active oxygen obtained by electrolysis, A., ii, 649.
- Boekhout, F. W. J.** See **J. J. Ott de Vries**.
- Bönninger, M.**, estimation of fat in blood, and the amount of fat in human blood, A., ii, 325, 359.
- Börnstein, Ernst**, oxidation of aniline, A., i, 375.
- oxidation of *p*-toluidine, A., i, 375.
- aniline black, A., i, 399.
- Boes, Johannes.** See **Richard Stoermer**.

- Boeseken, J.**, Friedel and Crafts' reaction, A., i, 474.
- Böttcher, O.**, estimation of nitrogen in saltpetre, A., ii, 124.
- action of the phosphoric acid and the nitrogen in "Leipzig poudrette" and in "von Krottnaurer's patent manure," A., ii, 471.
- Böttcher, O.** See also **Oscar Kellner**.
- Böttlinger, Carl**, esterification of glycerol, A., i, 661.
- manufacture of wine. IV. Soluble constituents of vine leaves, A., ii, 269.
- Bogdan, Petru**. See **Hans Jahn**.
- Bohrish, Paul**, analysis of soap, A., ii, 481.
- Bohrish, Paul**. See also **Adolf Beythien**.
- Bokorny, Thomas**, myrosin, A., i, 176.
- sensitiveness of enzymes; their relation to protoplasm, A., i, 177, 435.
- action of various chemicals on yeast and on the enzymes obtained from it, A., i, 437.
- proteids of seeds, A., ii, 415.
- invertase and maltase in yeast, A., ii, 568.
- Bollemont, E. Grégoire de**, action of amyl formate on ethyl sodiocyanoacetate, A., i, 116.
- ethoxy- and methoxy-methylene-cyanoacetic esters, A., i, 116.
- hydroxymethylene-cyanoacetic esters, A., i, 117.
- action of ammonia and aniline on hydroxymethylene-cyanoacetic esters and their alkyl derivatives, A., i, 131.
- Bollemont, E. Grégoire de**. See also **Jules Minguin**.
- Bolling, Randolph**, irregular distribution of sulphur in pig iron, A., ii, 124.
- modified Williams' method for estimating manganese, A., ii, 626.
- Bolm, Friedrich**, wine analysis, A., ii, 203.
- Bolser, C. E.** See **Walther Borsche**.
- Bombardini, Giuseppe**. See **N. Tarugi**.
- Bondareff**. See **Theodor T. Seliwanoff**.
- Bone, William Arthur**, and **David Smiles Jerdan**, the direct union of carbon and hydrogen. Part II., T., 1042; P., 1901, 162.
- the decomposition of hydrocarbons at high temperatures: preliminary note, P., 1901, 164.
- Bongert, A.**, action of phenylhydrazine and hydrazine on the two isomeric methyl butyrylacetates, A., i, 409.
- [pyrazolone derivatives from] methyl α -butyrylacetate, A., i, 653.
- Bongert, A.** See also **Louis Bouveault**.
- Bonnefoi, J.**, combination of haloid lithium salts with ammonia and amines, A., ii, 653.
- Bonney, Thomas George**, rocks from the Newlands diamond mines, S. Africa, A., ii, 251.
- Bordas, Fred.** See **C. Girard**.
- Bornstein, Karl**, proteid feeding and muscular work, A., ii, 254.
- Bornträger, Hugo**, humic acid and its function in nature, A., ii, 122.
- simple and rapid estimation of humic acid, A., ii, 212.
- analysis of peat, A., ii, 212.
- Borsche, Walther**, and **C. E. Bolser**, hydroxyazoaldehydes, A., i, 572.
- Bose, Emil**, electromotive efficiency of the elementary gases, II., A., ii, 589.
- equilibria at gas electrodes, A., ii, 635.
- Bose, Emil**, and **Hans Kochan**, electromotive efficiency of the elementary gases. III. Observations relative to a new electrode sensitive to light, A., ii, 590.
- Bose, R. Chuni Lal**, on the chemistry of *Nerium odorum*, P., 1901, 92.
- Bosse, Carl**, proof of the position [of the methyl groups] in dimethylphloroglucinol methyl ether, A., i, 207.
- Boudouard, Octave**, influence of pressure in phenomena of chemical equilibrium, A., ii, 151.
- reducing action of carbon on metallic compounds, A., ii, 314.
- the reversible reaction $\text{CO}_2 + \text{H}_2 \rightleftharpoons \text{CO} + \text{H}_2\text{O}$, A., ii, 383.
- aluminium and magnesium alloys, A., ii, 512.
- chemical equilibria, A., ii, 646.
- phenomena of combustion in furnaces, A., ii, 651.
- Bougault, J.**, conversion of anethole into anisic acid by five successive oxidations, A., i, 324.
- action of iodine and yellow mercuric oxide on anethole, estragole, saffrole, &c., A., i, 383.
- *p*-hydroxyhydratropic acid, A., i, 389.
- preparation of aldehydes $\text{R}\cdot\text{CHMe}\cdot\text{CHO}$ by means of cyclic hydrocarbons containing propenyl side chains, such as anethole, isosaffrole, &c., A., i, 392.
- *p*-methoxyatrolactic acid, A., i, 721.
- 3 : 4-dioxymethylenehydratropic aldehyde and acid, A., i, 721.
- Bouilhac, Raoul**, vegetation of *Nostoe punctiforme* in presence of different carbohydrates, A., ii, 571.

- Bouillet, H.**, action of iodic acid on uric acid; estimation of uric acid, A., ii, 290.
- Boulud.** See *Raphael Lépine*.
- Bouma, Jacob**, estimation of urinary indican as indigo-red by means of isatin and hydrochloric acid, A., ii, 487.
- Bounhiol**, respiration in Annelids, A., ii, 517.
- Bourcet, Paul**, origin of iodine in the organism, A., ii, 520.
- Bourcet, Paul.** See also *Henri Stassano*.
- Bourquelot, Emile [Elie]**, and *Henri Hérissé*, constitution of gentianose, A., i, 258.
- simultaneous presence of sucrose and gentianose in fresh gentian root, A., ii, 34.
- presence of seminase in non-germinating seeds containing horny albumen, A., ii, 69.
- composition of the albumen of the seeds of *Phoenix canariensis* and the chemical changes accompanying their germination, A., ii, 619.
- Bouveault, Louis**, 2-acetylthiuracil from wood-tar and its synthesis, A., i, 400.
- Bouveault, Louis**, and *A. Bongert*, action of butyryl chloride on methyl sodio-acetoacetate, A., i, 311.
- nitration of ethereal acetoacetates and their acyl derivatives, A., i, 500.
- product of nitration of ethyl acetoacetate, A., i, 579.
- Bouveault, Louis**, and *Léon [Alexandre] Tétry*, methyladipic acid from the oxidation of pulegone and β -methylcyclohexanone, A., i, 364.
- Bouveault, Louis**, and *André R. Wahl*, direct nitration in the fatty series, A., i, 4.
- constitution of the nitro-derivatives of ethyl dimethylacrylate; ethyl nitroacetate, A., i, 5.
- action of reducing agents on the two isomeric ethyl nitrodimehylacrylates, A., i, 114.
- conversion of dimethylacrylic acid into dimethylpyruvic acid, A., i, 252.
- constitution of α - and β -nitrodimehylacrylic esters, A., i, 664.
- Bowers, Henry L.** See *William B. Schober*.
- Bowman, Herbert Lister**, a rhombic pyroxene from South Africa, A., ii, 168.
- Boyd, D. R.**, action of the chlorides of phosphorus on aromatic ethers of glycerol. Diaryloxyisopropylphosphorous acids, T., 1221; P., 1901, 188.
- Bracci, Flaminio**, cultivation of olives, A., ii, 35.
- Brady, Friedrich.** See *Eugen Bamberg-er*.
- Bräutigam, Walter**, tiliadin, a constituent of the bark of lime trees, A., i, 93.
- behaviour of carbohydrates with hypochlorites, A., i, 671.
- Brakes, James**, colorimetric estimation of titanic acid, A., ii, 285.
- Brand, J.**, secretion and composition of human bile, A., ii, 459.
- Brandel, I. W.**, and *Eduard Kremers*, thymoquinone and thymoquinol in wild bergamot oil, A., i, 598.
- Brandel, I. W.** See also *Eduard Kremers*.
- Braren, Wilhelm**, and *Eduard Buchner*, a saturated dicyclic dicarboxylic acid, A., i, 85.
- ψ -phenylacetic acid or norcarnadienecarboxylic acid, A., i, 385.
- Brauer, Eberhard**, electrical properties of chromium during dissolution in acids, A., ii, 635.
- Braun, A.** See *Emilio Nöling*.
- Braun, Julius von**, condensation of methylhexanone with ethyl α -bromopropionate and ethyl α -bromoisobutyrate, A., i, 157.
- Braun, R.** See *Backhaus*.
- Brauner, Bohuslav**, on the atomic weight of praseodymium, P., 1901, 65.
- on praseodymium tetroxide and peroxide, P., 1901, 66.
- note on neodymium, P., 1901, 66.
- chemistry of thorium, P., 1901, 67.
- the standard of atomic weights, A., ii, 231.
- Brauner, Bohuslav**, and *F. Pavlíček*, the atomic weight of lanthanum and on the error of the "sulphate method" for the determination of the equivalent of the rare earths, P., 1901, 63.
- Braunmüller, E.** See *Johann Reinke*.
- Brauns, Reinhard**, relation of conchite to aragonite, A., ii, 395.
- Braunstein, Al.**, estimation of urea, A., ii, 140.
- Brearley, Harry.** See *Ernest Bagley*, and *Fred Ibbotson*.
- Bredig, Georg**, conversion of ammonia derivatives into ammonium hydroxides in aqueous solutions, A., i, 608.
- paralysis of platinum catalysis by "poisons," A., ii, 596.
- Bredig, Georg**, and *Kikunaye Ikeda*, inorganic ferments. II. Catalytic action of platinum as affected by poisons, A., ii, 441.

- Bredig, Georg**, and **W. Reinders**, inorganic ferments. III. Catalysis of hydrogen peroxide by gold, A., ii, 442.
- Bredt, Julius**, **F. Rochussen**, and **J. Monheim**, action of sulphuric acid on camphor and on camphane dichloride; resolution of the camphoceane ring, A., i, 217.
- Bremer, Gustav Jacob Wilhelm**, indices of refraction of solutions of calcium chloride, A., ii, 141.
- Bremer, W.** See **Josef König**.
- Brenans, P.**, iodo-derivatives of phenol, A., i, 322.
- [ethers and esters of 2:4-di-iodo- and 2:4:6-tri-iodophenol], A., i, 643.
- Breull, P.** See **Guido Bodländer**.
- Brewer, C. E.** See **William Ridgely Orndorff**.
- Brezina, E.**, derivatives of hydroxyquinol triethylether [1:2:4-triethoxybenzene], A., i, 534.
- alkylation of hydroxyquinol [1:2:4-trihydroxybenzene], A., i, 700.
- Brizard, Léopold**, reduction of nitroso-compounds of ruthenium and osmium, A., ii, 107.
- Brode, Johannes**, catalysis in the reaction between hydrogen peroxide and hydriodic acid, A., ii, 443.
- Brodie, Thomas Gregor**, immediate action of intravenous injection of blood-serum, A., ii, 118.
- Brögger, Waldemar Christofer** [mineral analyses], A., ii, 169.
- Brown, Adrian John**, heat of fermentation, A., ii, 304.
- Brown, Harold.** See **Wyndham Rowland Dunstan**.
- Brown, J. W.** See **S. P. Mulliken**.
- Brown, Oliver W.** See **Louis Munroe Dennis**.
- Browne, C. A., jun.**, and **C. P. Beistle**, complete analysis of feeding materials, A., ii, 481.
- Brück, O.**, constitution of dibromophthalic acid, A., i, 719.
- Brüning, Ed.** See **Alexander Tschirch**.
- Bruhat, J.** See **Ferdinand Jean**.
- Bruhn, G. A.** See **Otto Fischer**.
- Bruhns, H.**, dichloroacetylcatechol and dichloroacetylpyrogallol, A., i, 215.
- action of alkalis on chlorinated hydroxy-ketones, A., i, 216.
- Brunck, Otto**, estimation of ozone, A., ii, 38.
- cyanogen compounds of silver and copper in gravimetric analysis, A., ii, 478.
- crystalline form of telluric acid, A., ii, 649.
- Brunck, Otto**, crystalline metallic compounds of aluminium, A., ii, 656.
- Bruner, Ludwik**, dynamic investigation of the bromination of aromatic compounds, A., ii, 441.
- Bruner, Ludwik**, and **Stanislaw Tolloczko**, velocity of solution of solid substances, A., ii, 10.
- Bruni, Giuseppe**, solid solutions in mixtures of three substances, A., ii, 11.
- Bruni, Giuseppe**, and **F. Gorni**, solid solutions in mixtures of three substances, II., A., ii, 150.
- Brunner, Josef.** See **Wilhelm von Miller**.
- Brunner, Karl**, constitutional formula of Fischer's base, A., i, 407.
- Bruno, Albert**, a small laboratory furnace, A., ii, 152.
- Bruns, D.** See **Johannes Gadamer**.
- Brunton, Sir Thomas Lauder**, a possible cause of clumping in Bacilli, A., ii, 69.
- Brunton, Sir Thomas Lauder**, and **Herbert Rhodes**, a glycolytic enzyme in muscle, A., ii, 563.
- Bruyn, B. R. de.** See **Arnold Frederik Holleman**.
- Bruyn, Cornelis Adriaan Lobry de**, size of the particles present in colloidal solutions or pseudo-solutions, A., ii, 90.
- Bruyn, Cornelis Adriaan Lobry de**, and **J. J. Blanksma**, aromatic nitro-compounds. XVI. Comparative study of the three dinitrobenzenes. III. Action of sodium monosulphide, A., i, 460.
- Bruzzo, Matteo.** See **Guido Pellizzari**.
- Bry, Eduard.** See **Franz Sachs**.
- Buchholz, Yngre.** See **Robert Behrend**.
- Buchner, Eduard**, expressed yeast-cell-plasma (Buchner's zymase), A., i, 108.
- zymase from sterilised yeast, A., i, 179.
- Buchner, Eduard**, and **C. von der Heide**, new condensation of ethyl diazoacetate, A., i, 232.
- Buchner, Eduard**, and **Rudolf Rapp**, alcoholic fermentation without yeast cells, X., A., ii, 465.
- Buchner, Eduard.** See also **Wilhelm Braren**.
- Buchner, Georg**, assay of bees-wax, A., ii, 208.
- Buchner, Hans, F. Fuchs**, and **L. Megele**, action of alcohol on the arterial blood stream, A., ii, 562.
- Buchner, Hans**, and **L. Geret**, a crystalline [peptone-serum product] ("Immunisierungs-produkt"), A., i, 783.
- Buchner, Max.** See **Arthur Hantzsch**.

- Buddéus, Wilhelm**, estimation of gold and silver in pyrites, A., ii, 133.
- Büchner, E. H.** See *Ernst Cohen*.
- Bücking, Hugo**, cordierite from Celebes and Germany, A., ii, 64.
- Bülou, Carl**, phenylmethylpyrazolecarb-
oxylic acids, A., i, 98.
- Bülou, Carl**, and **Hans Grotowsky**,
phenylacetylacetophenone (phenyl-
acetylbenzoylmethane, phenacyl benzyl
ketone), A., i, 475.
- Bülou, Carl**, and **Wilhelm Höpfner**,
compounds of ethyl acetonedicarboxyl-
ate with diazo-compounds and their
decomposition products, A., i, 239.
- Bülou, Carl**, and **Alfred Schlesinger**,
preparation of pyrazole derivatives from
azo-compounds of diacetosuccinic esters,
A., i, 98.
- Bülou, Carl**, and **Walther von Sicherer**,
derivatives of 1:4-benzopyranol, the
parent substance of a new class of
colouring matters, III., A., i, 603.
- Bülou, Carl**, and **Hermann Wagner**,
derivatives of 1:4-benzopyranol, the
parent substance of a new class of
colouring matters, A., i, 400, 559.
- Bürker, K.**, studies on the liver. I.
Absorption in the liver, A., ii, 178.
- Bujard, Alfons**, estimation of glycogen,
A., ii, 700.
- Bujor, Paul**, salt lakes of Roumania, A.,
ii, 114.
- Bukschnewski, David**. See *Hans Jahn*.
- Bull, Henrik**, action of sodium ethoxide
on fats, A., ii, 137.
- Bullnheimer, Friedrich**, estimation of
tungsten in ores, A., ii, 41.
— estimation of fluorine in zinc blends,
A., ii, 191.
- Bumcke, G.** See *Richard Wolfenstein*.
- Bunel, L.** See *Paul Freundler*.
- Bunge, Gustav von**, effects of the in-
creased consumption of sugar, A.,
ii, 458.
- Buntrock, A.**, later developments of the
chemistry of the anthracene dyes, A.,
i, 602.
- Buraczewski, J.** See *Leon March-
lewski*.
- Burgess, Charles Hutchens**, and **David
Leonard Chapman**, non-existence of
the so-called suboxide of phosphorus.
Part II. T., 1235; P., 1901, 189.
- Burgess, Herbert Edward**, two new
substances in lemon oil, P., 1901, 171.
— oil of citron, A., ii, 702.
- Burkard, Emil**. See *Hans von Pech-
mann*.
- Burow, Rob.**, [lecithin in brain and milk],
A., ii, 30.
- Busch, Frederic W.** See *Leon Asher*.
- Busch, Max**, stereoisomerism of the
hydrazones of the esters of dithio-
carbonic acid, A., i, 430.
— constitution of the urazines, A.,
i, 488, 616.
- Busch, Max**, and **Alfred Grohmann**,
syntheses in the urazole series, A.,
i, 616.
- Busch, Max**, and **C. Heinrichs**, 1:4-
dialkylurazoles, A., i, 617.
- Busch, Max**, and **Herm. Holzmann**,
isomeric thiosemicarbazides, A.,
i, 234.
- Busch, Max**, and **E. Wolpert**, [and, in part,
Gustav Obermiller], action of thiocarb-
imides on dithiocarbazinic acids, A.,
i, 233.
- Busnikoff, W. I.**, specific gravities of
solutions of three substances: alcohol,
ether, and water, A., i, 306.
— absorption of water vapour by chem-
ical compounds, A., ii, 58.
— absorption of water vapour by
definite chemical compounds; distri-
bution of the absorbed water between
two similar and two dissimilar sub-
stances, A., ii, 496.
- Buss, A.** See *August Michaelis*.
- Butkewitsch, Wl.**, presence of a prote-
olytic ferment in germinated seeds and
its action, A., ii, 182, 466.
- Butzureanu, Vasile C.**, metasilicic acid,
A., ii, 652.
— analyses of pyrites, A., ii, 662.
- Byl.** See *Hendrik Willem Bakhris
Roozeboom*.

C.

- Caldwell, B. Palmer.** See *Harry Clary
Jones*.
- Calov, G.** See *Richard Stoermer*.
- Calvello, E.** See *Francesco Angelico*.
- Calvert, Harry T.** See *Frederick
William Skirrow*.
- Camerer, William, jun.**, composition of
sweat, A., ii, 459.
- Camerer, William, jun.**, and **Friedrich
Söldner**, chemical composition of new-
born children, A., ii, 173.
- Camichel, Charles**, relation between the
chemical constitution of the triphenyl-
methane colouring matters and their
absorption spectra in aqueous solution,
A., i, 100.
- Camichel, Charles**, and **Pierre Henri
Bayrac**, absorption spectra of the indo-
phenols and of dyes derived from
triphenylmethane, A., i, 296.
— new method of characterising
colouring matters: application to
indophenols, A., ii, 297.

- Camichel, Charles.** See also *Pierre Henri Bayrac*.
- Cammerloher, M. von.** See *Otto Fischer*.
- Camo.** See *William Oechsner de Coninck*.
- Campetti, Adolfo,** polarisation of magnesium in alkaline solutions, A., ii, 590.
— relations between solubility and heat of solution, A., ii, 642.
- Camps, Rudolf,** conversion of aminophenylpropionic acid into kynurenic acid and allied compounds, A., i, 751.
- Camus, Lucien,** effect of intravenous injection of milk on the coagulability of the blood, A., ii, 116.
— fibrinolysis, A., ii, 256.
- Camus, Lucien, and Eugène Gley,** properties of pancreatic juice in starving animals, A., ii, 324.
- Canter, Hall,** *o*-phenylsulphonebenzoic acid and its derivatives, A., i, 208.
- Carette, [Denis] Henri,** methyl nonyl ketone, A., i, 13, 127, 367.
- Carles, P.,** an oxydase in valerian, A., i, 59.
— simultaneous presence of barium and sulphates in mineral waters, A., ii, 506.
- Carnielli, G.,** estimation of boric acid, A., ii, 690.
- Carnot, Adolphe,** gold and silver tellurides from the Kalgoorlie District (Western Australia), A., ii, 515.
- Carpentieri, F.,** detection of added sulphuric acid in wine, A., ii, 191.
- Carrara, Giacomo,** hydrate of sulphuryl chloride and its solution in water without change, A., ii, 549.
- Carrara, Giacomo, and M. G. Levi,** electro-striction of ions in organic solvents, A., ii, 3.
- Carrière, G.,** influence of lecithin on nutritive exchanges, A., ii, 610.
- Carter, William, and William Trevor Lawrence,** derivatives of ethyl α -methyl- β -phenyleyanoglutamate, P., 1900, 178.
- Carter, William.** See also *Robert Howson Pickard*.
- Carter, William S.,** physiological action of three poisonous toadstools, A., ii, 409.
- Cash, John Theodore, and Wyndham Rowland Dunstan,** pharmacology of pyraconitine and methylbenzacaquine considered in relation to their chemical constitution, A., ii, 612.
— pharmacology of pseudaconitine and japaconitine considered in relation to that of aconitine, A., ii, 613.
- Caspari, Wilhelm,** proteid metabolism and muscular work, A., ii, 254.
- Caspari, Wilhelm,** feeding on small amounts of proteid, A., ii, 609.
- Cassella, Leopold, & Co.,** 2 : 8-dihydroxy-3 : 7-dimethylacridine, A., i, 752.
— 1:7-diamino-2-hydroxynaphthalene, A., i, 760.
- Castner, W.,** *o*-nitrophenyl-5-ethyl-2-picolyalkaline [5- β -hydroxy- β -*o*-nitrophenylethyl-1-ethylpyridine] and its derivatives, A., i, 562.
- Cates, William Arthur,** estimation of hippuric acid, A., ii, 358.
- Cathelineau, and Jean Hausser,** empyreumatic oil of juniper, A., i, 283.
- Caubet, F.,** liquefaction of gaseous mixtures, A., ii, 147.
— liquefaction of gaseous mixtures; variation of the concentration of the two co-existent liquid and gaseous phases along the isothermals, A., ii, 148.
- Causse, Henri [Eugène],** presence of ferrous oxythiocarbonate in the water of the Rhône, A., ii, 61.
— action of sodium *p*-diazobenzene-sulphonate on iron cystinate in contaminated water, A., ii, 133.
— reaction characteristic of pure waters, A., ii, 581.
- Cavalier, Jacques,** acidimetry of phosphoric acid with the hydroxides of calcium, strontium, and barium, A., ii, 502.
- Cavazzani, E.,** oxydase in cerebro-spinal fluid, A., ii, 257.
- Caven, Robert Martin,** organic derivatives of phosphoryl chloride and the space configuration of the valencies of phosphorus, P., 1901, 26.
- Cayvan, L. L.** See *A. G. Woodman*.
- Cazeneuve, Paul,** acid and alcoholic compounds of diphenylcarbazine or phenylhydrazine ureide, A., i, 292.
— diphenylcarbodiazone, A., i, 297.
— constitution of mixed carbonic esters of alcohols and phenols, A., i, 497.
— hydrochloride of phenylhydrazine ureide [diphenylcarbazine], A., i, 655.
— violet chromium colouring matters from diphenylcarbazine, A., i, 655.
— chemical energy of formic acid; displacement of the nitric acid of nitrates by formic acid, A., ii, 379.
— simple reflux apparatus, A., ii, 379.
— use of diphenylcarbazine for the detection of chromic acid in cotton dyed with chrome yellow, A., ii, 626.
- Cazeneuve, Paul, and H. Défournel,** detection and estimation of nitrates in water with brucine and glacial formic acid, A., ii, 532.
- Ceipek, L.** See *Franz Erben*.

- Chabrié, Camille**, cesium compounds, A., ii, 314, 600.
- Chabrié, Camille**, and **Étienne Rengade**, position of indium in the classification of the elements, A., ii, 102.
- indium, A., ii, 242.
- Chain, Michael**. See **Wilhelm Marckwald**.
- Chapelle, Ph.** See **G. Meillère**.
- Chapman, Alfred Chaston**, santalenic acid, T., 134; P., 1900, 204.
- new colour reaction for distinguishing between certain isomeric allyl and propenyl phenols, A., ii, 76.
- detection of arsenic in beer and brewing materials, A., ii, 125.
- arsenic in coal and coke, A., ii, 690.
- Chapman, David Leonard**. See **Charles Hutchens Burgess**.
- Chapman, Edgar Marsh**. See **Arthur Lapworth**.
- Charabot, Eugène**, formation of terpene derivatives in the geranium, A., i, 38.
- genesis of terpenoid compounds in plants, A., ii, 34.
- rôle of the chlorophyllic function in the evolution of terpenoid compounds, A., ii, 183.
- Charabot, Eugène**, and **Alexandre Hébert**, mechanism of esterification in plants, A., ii, 619.
- Charrin, Albert**, physiological relations of intermittent albuminuria, A., ii, 181.
- Charrin, Albert**, and **A. Guillemonat**, anemia during gestation, A., ii, 611.
- Charrin, Albert**, and **Moussu**, action of mucus on the organism, A., ii, 180.
- coagulating properties of mucin, A., ii, 404.
- Charteris, Francis J.** See **Ralph Stockman**.
- Chassevant, Allyre**, action of "saccharin" on gastric digestion, A., ii, 323.
- Chassevant, Allyre**. See also **Armand Gautier**.
- Chattaway, Frederick Daniel**, and **Kennedy Joseph Previte Orton**, the preparation of acetylchloroamino-benzene and some related compounds, T., 274; P., 1900, 231.
- the action of acetylchloro- and acetylbromo-aminobenzenes on amines and phenylhydrazine, T., 461; P., 1901, 38.
- the preparation of *o*-chloroaniline, T., 469; P., 1901, 39.
- the symmetrical chlorodibromo- and dichlorobromo-anilines and chloro- and bromoamino-derivatives of chlorobromoacetanilides, T., 816; P., 1901, 124.
- Chattaway, Frederick Daniel**, and **Kennedy Joseph Previte Orton**, the replacement of bromine by chlorine in anilines, T., 822; P., 1901, 125.
- chloro- and bromo-amino-derivatives of diacetylphenylenediamines, A., i, 227.
- chloro-derivatives of *s*-diphenylcarbamide and their reactions, A., i, 381.
- bromination of *s*-diphenylcarbamide, A., i, 382.
- Chattaway, Frederick Daniel**, **Kennedy Joseph Previte Orton**, and **Robert C. T. Evans**, substituted nitrogen chlorides and bromides derived from *o*-, *m*-, and *p*-nitroacetanilides, A., i, 23.
- Chauveau, [Jean Baptiste] Auguste**, [value of alcohol as a source of muscular energy], A., ii, 176.
- Chauveau, Auguste**, and **Tissot**, impermeability of skin and external mucous membranes to hydrogen sulphide, A., ii, 611.
- Chavanne, pyromucic and isopyromucic acids**, A., i, 649.
- Chavastelon, R.**, action of acetylene on cuprous chloride dissolved in a neutral solution of potassium chloride, A., i, 494.
- Chemische Fabrik auf Aktien (Schering)**, phenoxyacetic anhydride, A., i, 708.
- Chemische Fabrik Griesheim-Elektron**, 1 : 5-chloronitronaphthalene from 1-chloronaphthalene, A., i, 687.
- preparation of 4-nitro- α -naphthylamine and its alkyl derivatives from 1-chloro-4-nitronaphthalene, A., i, 695.
- preparation of 4-nitro- α -naphthol and its ethers from 1-chloro-4-nitronaphthalene, A., i, 698.
- $\beta\zeta$ -dimethyl- β -e-octadiene- θ -al, an isomeride of citral, A., i, 731.
- $\beta\zeta$ -dimethyl- β -e-octadiene- θ -al, A., i, 731.
- Chemische Fabrik von Heyden**, phenyl carbonates, A., i, 696.
- preparation of indigo and its derivatives from the esters of phenylglycine-*o*-carboxylic acid, A., i, 714.
- chloro-derivatives of the pyridine bases, A., i, 748.
- Chevrotier**. See **Auguste Lumière**.
- Chilesotti, Alberto**, electrolytic reduction of aromatic nitro-compounds to amines, A., i, 587.
- Chlopin, Grigori V.**, organic bases of Russian petroleum, A., i, 42.
- Chodat, Robert**, and **N. O. Hofman-Bang**, bacteria producing lactic acid and their importance in the ripening of cheese, A., ii, 264.

- Choina.** See *Theodor T. Seliwanoff*.
- Christensen, A.**, perbromides of cinchona alkaloids, A., i, 481.
- Christensen, Odin T.**, manganic acetate, A., i, 498.
- manganese compounds. II. Manganic acetate and manganese alums, A., ii, 512.
- Christomanos, Anastasios K.**, alleged conversion of phosphorus into arsenic, A., ii, 59.
- Chrutchoff, Paul**, cryoscopic researches, A., ii, 86, 373.
- Ciamician, Giacomo Luigi**, and *Paul G. Silber*, chemical action of light, A., i, 36, 329, 390, 547.
- Ciani, Hugo.** See *August Michaelis*.
- Cipollina, A.**, oxalic acid in the organism, A., ii, 668.
- influence of foreign substances on Trommer's sugar test, A., ii, 698.
- Claisen, Ludwig**, and *E. Haase*, transformation of *O*-acyl derivatives of ethyl acetoacetate into the isomeric *C*-acyl derivatives, A., i, 118.
- Clark, John**, composition of Dutch butter, A., ii, 430.
- Clark, Judson F.**, toxic value of mercuric chloride and its double salts, A., ii, 526.
- Clarke, Frank Wigglesworth**, contributions to chemistry and mineralogy, A., ii, 63.
- analyses of rocks, A., ii, 66.
- report of the [American] committee on atomic weights, A., ii, 379.
- Clarke, G.** See *Frederic Stanley Kipping*.
- Claude, H.**, and *Aly Zaky*, lecithin in tuberculosis, A., ii, 673.
- Claudius, O.** See *Theodor Posner*.
- Clausen**, green manure experiments with potatoes, A., ii, 72.
- Clauser, Robert**, eugenolglycollic acid [eugenoxycetic acid], A., i, 388.
- estimation of the nitroso-groups in organic compounds, A., ii, 422.
- Clautriau, Georges**, digestion in the ascidia of *Nepenthes*, A., ii, 183.
- Clayton Aniline Co.**, thiosulphonic acids of aromatic amines and *m*-diamines, A., i, 694.
- Cleeff, G. Doyer van**, demonstration of the action of normal salts on solutions containing hydroxyl ions, A., ii, 505.
- Cleghorn, Allen**, and *H. D. Lloyd*, effect of carbon dioxide and oxygen on smooth muscle, A., ii, 255.
- Clemm, Hans.** See *Theodor Curtius*.
- Clerfeyt, Charles**, experiments with yeast cells in concentrated saline solutions, A., ii, 677.
- Cloetta, Max**, preparation and composition of the *Digitalis* glucosides, A., i, 478.
- Cloez, Charles**, nitration of the disubstitution derivatives of benzene, A., i, 72.
- Clover, A. M.** See *Paul C. Freer*.
- Coehn, Alfred**, ammonium amalgam, A., ii, 155.
- electrochemical behaviour of acetylene, A., ii, 539.
- Coffetti, Giulio**, energy of non-carboxylic organic acids, A., i, 29.
- Cohen, Emil Wilhelm**, granular and compact meteoric irons, A., ii, 251.
- meteoric iron from Kokstad, Bethanien, and Muchachos, A., ii, 399.
- Cohen, Ernst**, physico-chemical researches on tin, III., A., ii, 106.
- Weston cadmium cell, A., ii, 142.
- experimental determination of the limiting heat of solution, I., A., ii, 147.
- enantiotropy of tin, VI., A., ii, 244.
- Cohen, Ernst**, and *E. H. Büchner*, Étard's law of solubility, A., ii, 375.
- Cohen, Ernst**, [and *A. W. Visser*], measurement of the work done by affinity, A., ii, 376.
- Cohen, Julius Berend**, and *Henry Drysdale Dakin*, the aluminium-mercury couple. Part III. Chlorination of aromatic hydrocarbons in presence of the couple. The constitution of the dichlorotoluenes, T., 1111; P., 1901, 91.
- Cohen, Julius Berend**, and *C. E. Whiteley*, experiments on the production of optically active compounds from inactive substances, T., 1305; P., 1900, 212.
- Cohen, Lillian.** See *Everhart P. Harding*.
- Cohn, Georg**, aromatic phenoxyacetamides, A., i, 352.
- condensation products of phenoxyacetic acids with *o*-aminophenol, A., i, 752.
- Cohn, Paul**, 3 : 3'-dichlorobenzidine, A., i, 166.
- chloro-*m*-phenylenediamine, A., i, 407.
- chlorination of *o*-nitrotoluene, A., i, 637.
- new diphenylamine derivatives, A., i, 642.
- Cohn, Robert.** See *Arthur Rosenheim*.
- Cohnheim, Otto**, non-permeability of the wall of the urinary bladder, A., ii, 564.
- digestion and metabolism in echi-
noderms, A., ii, 668.

- Cohoe, *Wallace P.* See *Charles Loring Jackson*.
- Cole, *Sidney W.* See *F. Gowland Hopkins*.
- Collet, *A.*, iodine derivatives of [acetophenone], *A.*, i, 35.
- Colley, *A.*, derivatives of dextrose and galactose, *A.*, i, 671.
- Collie, *John Norman*, on the decomposition of carbon dioxide when submitted to electric discharge at low pressures, *T.*, 1063; *P.*, 1901, 168.
- Collie, *John Norman*. See also *W. Garsed*.
- Collins, *Sydney Hoare*, estimation of sugar in swedes, *A.*, ii, 583.
- Colman, *James*. See *Siegmund Gabriel*.
- Colson, *Albert*, rarefied gases, *A.*, ii, 160.
— some conditions of reversibility, *A.*, ii, 238.
— action of bases and acids on salts of the amines, *A.*, ii, 496.
- Coninck. See *Oechsner de Coninck*.
- Conn, *Wallace T.* See *Arthur Michael*.
- Conrad, *Max*, oxalyldialkylacetoacetic esters, *A.*, i, 65.
- Conrad, *Max*, and *H. Reinbach*, condensation of barbituric acid with aldehydes, *A.*, i, 410.
- Conroy, *James Terence*, rate of dissolution of iron in hydrochloric acid, *A.*, ii, 388.
- Conroy, *James Terence*, *Oliver Heslop*, and *J. B. Shores*, action of reducing gases on thiocyanates, *A.*, i, 373.
- Conroy, *Sir John*, obituary notice of, *T.*, 889.
- Constam, *Emil Joseph*, and *J. Cora Bennett*, constitution of the perborates, *A.*, ii, 17, 314.
- Conti, *A.*, and *Giuseppe Testoni*, apiin and apigenin, *A.*, i, 398.
- Cook, *A. N.*, and *Homer Winthrop Hillyer*, derivatives of phenyl ether, *A.*, i, 144.
- Cook, *O. F.*, camphor excreted by an animal (Polyzonium), *A.*, ii, 179.
- Coomara-Swamy, *Ananda K.*, Ceylon rocks and graphite, *A.*, ii, 171.
- Coppadoro, *Angelo*, reciprocal influence of two catalytic reactions in the same medium, *A.*, ii, 544.
- Coppet, *Louis Casimir de*, spontaneous crystallisation of the hydrate $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ from saturated solutions of sodium sulphate. Limit of the metastable state in these solutions, *A.*, ii, 384.
— molecular depression of the temperature of maximum density of water produced by the dissolution of chlorides, bromides, and iodides of the alkali metals, *A.*, ii, 493.
- Cordier, *V. von*. See *Friedrich Emich*.
- Cornelio, *L.* See *C. Martinotti*.
- Corstorphine, *Robert Henry*. See *George Gerald Henderson*.
- Cortese, *G.* See *Antonio Piccinini*.
- Cossettini, *G.*, philothion, *A.*, i, 435.
- Cotton, *S.*, action of hydrogen peroxide on blood; easy means of differentiating the blood of man from that of animals, *A.*, ii, 295.
- Cottrell, *F. G.*, solubility of manganous sulphate, *A.*, ii, 12.
- Cottrell, *F. G.* See also *Wilhelm Meyerhoffer*.
- Coupon, *Henri*, toxicity of sodium, potassium, and ammonium compounds as regards higher plants, *A.*, ii, 122.
— sensibility of higher plants to very feeble amounts of toxic substances, *A.*, ii, 335.
— sensibility of higher plants to the action of potassium salts, *A.*, ii, 525.
- Cousin, *H.*, action of nitric acid on tribromoguaiacol, *A.*, i, 82.
— action of nitric acid on tetriodopyrrole (iodole), *A.*, i, 347.
- Cousins, *Herbert Henry*, banana soils of Jamaica, *A.*, ii, 681.
- Countourier, *F.* See *Léo Vignon*.
- Covelli, *Ercole*, general reaction of the aromatic amines and hydrazines with wood, *A.*, ii, 705.
- Craciun, *R. L.*, variations in the composition of the bile, *A.*, ii, 459.
- Crafts, *James Mason*, catalysis in concentrated solutions, *A.*, ii, 444.
- Craig, *A. G.*, estimation of formaldehyde, *A.*, ii, 703.
- Cramer, *W.*, α -disubstituted biguanides and guanamines, *A.*, i, 771.
- Crampton, *Charles A.*, and *Frank D. Simons*, detection of foreign colouring matter in spirits, *A.*, ii, 134.
- Crépieux, *Pierre*. See *Frédéric Reverdin*.
- Crew, *Henry*, arc spectra of some metals as influenced by an atmosphere of hydrogen, *A.*, ii, 81.
- Cristaldi. See *Grassi-Cristaldi*.
- Crompton, *Holland*, note on the latent heats of evaporation of liquids, *P.*, 1901, 61.
- Crosby, *J. H.* See *Herbert S. Jennings*.
- Cross, *Charles Frederick*, and *Edward John Bevan*, the ketonic constitution of cellulose, *T.*, 366; *P.*, 1901, 22; discussion, *P.*, 23.
— cellulose xanthates, *A.*, i, 452.
- Cross, *Charles Frederick*, *Edward John Bevan*, and *R. Leonard Jenks*, mixed esters of cellulose and the behaviour of cellulose towards nitrating acids, *A.*, i, 672.

- Cross, Charles Frederick.** See also *Arthur George Green.*
- Crossley, Arthur William,** the interaction of ethyl sodiomethylmalonate and mesityl oxide, T., 138; P., 1900, 90.
- preparation and properties of 2:6-diketo-4-isopropylhexamethylene (2:6-dihydroxy-4-isopropylidihydroresorcinol), P., 1901, 172.
- Cumenge, E.,** robellazite, a new mineral, A., ii, 111.
- Cunaeus, E. H. J.,** determination of the refractive power as a method for the investigation of the composition of co-existing vapour and liquid phases, A., ii, 213.
- Curie, P., and A. Debierne,** radioactivity induced by radium salts, A., ii, 216.
- induced radioactivity and gases made active by radium, A., ii, 298.
- radioactivity of salts of radium, A., ii, 589.
- Curtius, Theodor, and Hans Clemm,** hydrazides and azoimides of organic acids. XVII. Synthesis of $\alpha\gamma$ -diaminopropane and $\alpha\zeta$ -diaminohexane from glutaric and suberic acids respectively, A., i, 68.
- Curtius, Theodor, and August Darapsky,** benzylazide [benzylazoimide], A., i, 573.
- Curtius, Theodor, and H. Franzen,** preparation of *as*-secondary benzalhydrazines from benzaldazines, A., i, 293.
- Curtius, Theodor, and August Hesse,** hydrazides and azoimides of organic acids. XIX. Synthesis of $\alpha\beta\gamma$ -triaminopropane from tricarballylic acid, A., i, 70.
- Curtius, Theodor, and C. Müller,** formation of ethyl allophanate from the azoimides of hydroxy-acids, A., i, 779.
- Curtius, Theodor, and H. Pauli,** oxidation of symmetrical secondary benzylhydrazines to hydrazones, A., i, 429.
- Curtius, Theodor, and Wilhelm Steller,** hydrazides and azoimides of organic acids. XVIII. Synthesis of $\alpha\delta$ -diamino-octane from the azide of sebacic acid, A., i, 70.
- Cushing, Harvey,** poisonous effect of pure sodium chloride on nerve-muscle preparations, A., ii, 671.
- Cushman, Allerton Seward,** some modified forms of physico-chemical measuring apparatus, A., ii, 596.
- Cutter, William D.** See *Leon Asher.*
- Cyon, E. von, and Ad. Oswald,** physiological action of substances from the thyroid, A., ii, 180.
- Czapek, Friedrich,** carbohydrate metabolism in winter leaves, A., ii, 571.
- D.**
- D'Achiardi, Giovanni,** opals from Tuscany, A., ii, 109.
- Dafert, Franz W.,** mercurial poisoning of green plants, A., ii, 269.
- manurial effect of degelatinised bone meal, A., ii, 275.
- manurial experiments with crude phosphate, A., ii, 620.
- Dafert, Franz W., and Ad. Halla,** free iodine in sodium nitrate, A., ii, 621.
- Dafert, Franz W., and Otto Reitmair,** effect of different forms of phosphoric acid, A., ii, 275.
- Dakin, Henry Drysdale,** estimation of manganese and cobalt as phosphates, A., ii, 131.
- Dakin, Henry Drysdale.** See also *Julius Berend Cohen.*
- Dalsen, B. M. van.** See *P. Kohnstamm.*
- Dalle, Paul.** See *Louis Henry.*
- Daly, Reginald A.,** calcareous concretions of Kettle Point, Ontario, A., ii, 516.
- Dam, W. van, and J. H. Aberson,** velocity of intramolecular migration of bromoamides under the influence of an alkali, A., ii, 88.
- Darapsky, August.** See *Theodor Curtius.*
- Dastre, A.,** chloroformic dialysis and endo-cellular ferments, A., ii, 325.
- Daszewski, A. von,** effect of water and manure on the composition of potato ash, A., ii, 72.
- Davidson, William B.** See *Francis Robert Japp.*
- Davies, Charles T.** See *Robert Job.*
- Davies, Herbert E.,** decomposition of chlorides by ignition with organic matter, A., ii, 277.
- Davies, J.** See *Frederick William Streatfeild.*
- Davis, Charles A.,** natural history of marl, A., ii, 516.
- Davis, Charles B.,** elimination and estimation of water in oils, fats, and waxes, A., ii, 629.
- Davison, John M.,** analysis of the Kesen meteorite, A., ii, 172.
- Dawson, Harry Medforth,** on the nature of polyiodides and their dissociation in aqueous solution, T., 238; P., 1900, 215.
- Dawson, Harry Medforth, and John McCrae,** metal-ammonium compounds in aqueous solution. Part II. The absorptive powers of dilute solutions of salts of the alkali metals, T., 493; P., 1901, 5.

- Dawson, Harry Medforth**, and **John McCrae**, metal-ammonia compounds in aqueous solution. Part III. Solutions of salts of the alkaline earth metals, T., 1909; P., 1901, 177.
- metal-ammonia compounds in aqueous solution. Part IV. The influence of temperature on the dissociation of copper-ammonia sulphate, T., 1902; P., 1901, 178.
- electro-affinity of the metals, A., ii, 222.
- Day, Arthur**. See **Ludwig Holborn**.
- Dean, George**, immunity in relation to the pancreas and its ferments, A., ii, 563.
- Debierne, A.** See **P. Curie**.
- Decker, Herman**, constitution of pyridones, quinolones, and analogous bases, A., i, 96.
- formations of *ana*-nitroquinoline [5-nitroquinoline] from *m*-nitroaniline, A., i, 611.
- Decker, Herman**, [with **N. Kasatkin**, and **G. Pollitz**], nitroquinolones and nitrocarbostyrils, A., i, 654.
- Défacz, Edouard**, a new tungsten phosphide, A., ii, 105.
- tungsten arsenide and chloroarsenide, A., ii, 163.
- tungsten, A., ii, 244, 284.
- Défacz, Edouard**, and **Marcel Guichard**, specific heats of tungsten and molybdenum, A., ii, 659.
- Défournel, H.**, metallic "saccharinates," A., i, 324.
- basic quinine "saccharinate," A., i, 482.
- action of "saccharin" on phenylhydrazine ureide [diphenylcarbazine], A., i, 487.
- estimation of "saccharin" in alimentary substances, A., ii, 588.
- Défournel, H.** See also **Paul Cazenave**.
- Dehétrain, Pierre Paul**, and **Em. Demoussy**, germination in distilled water, A., ii, 266.
- Dehétrain, Pierre Paul**, and **C. Dupont**, fermentation of nitrogenous substances in farmyard manure, A., ii, 634.
- Dehlholm, V.**, estimation of fat in cream, A., ii, 359.
- Dehnel, E.**, action of bromine on 3-picoline, A., i, 164.
- 2-phenyl-6-stilbazole and 2-phenyl-6-*o*-hydroxystilbazole, A., i, 165.
- Deinhardt, Alex.** See **Theodor Posner**.
- Delacroix, A. E.**, copper antimonates, A., ii, 316.
- antimonie acids, A., ii, 318.
- Delage, Marcel**, pyrogallolsulphonic acids, A., i, 274, 643.
- Delage, Yves**, experimental parthenogenesis, A., ii, 611.
- Delage, Yves**, and **Marcel Delage**, [parthenogenesis], A., ii, 177.
- Delange, Raymond**. See **Charles Mouren**.
- Delépine, Marcel**, acetals of polyhydric alcohols, A., i, 3.
- formation and decomposition of acetals, A., i, 254.
- velocities of formation and decomposition of methylal at the ordinary temperature, A., i, 314.
- heats of formation of acetals and their isomerides, A., i, 314.
- action of alcohols on the acetals of monohydric alcohols, A., i, 365.
- iminodithiocarbonic esters, RN:C (SR)₂, A., i, 518.
- researches on the acetals, A., i, 669.
- acetals of monohydric alcohols, A., ii, 6.
- Delépine, Marcel**. See also **Camille Matignon**.
- Delfino, V.**, and **M. Miranda**, estimation of acetic acid, A., ii, 45.
- Delle, Ed.**, detection of starch-sugar in wine, A., ii, 44.
- estimation of "saccharin" in beverages, A., ii, 46.
- Delluc, G.** See **Thomas Roman**.
- Demarçay, Eugène [Anatole]**, spectra of samarium and gadolinium, A., ii, 102.
- europium, a new element, A., ii, 511.
- Demjanoff, Nicolaus I.**, action of nitrous acid on propylene; propylene nitrosite, A., i, 493.
- action of nitric anhydride on camphene, A., i, 554.
- Demjanoff, Nicolaus I.**, and **M. Luschnikov**, action of nitrous acid on tetramethylenylmethylamine [ω -aminomethylcyclobutane]; methylenetetramethylene bromide, A., i, 509.
- Demmer, Fritz**, action of hydrazine hydrate on α -methyl- β -ethylacetaldehyde, A., i, 255.
- Demoussy, Em.**, germination of wheat grain treated with copper sulphate, A., ii, 570.
- Demoussy, Em.** See also **Pierre Paul Dehétrain**.
- Demuth, Ed.** See **Eugen Bamberger**.
- Denigès, Georges**, method for the destruction of organic matter applicable to the detection of inorganic poisons, more especially arsenic and antimony, A., ii, 690.
- Denissenko, P.** See **Carl Adam Bischoff**.
- Denk, A.** See **Friedrich Kehrman**.

- Dennis, Louis Munroe**, and **Oliver W. Brown**, potassium perselenate, A., ii, 501.
- Denstedt, Maximiliano**, decomposition of albumin, A., i, 780.
- Denoyés, Martre**, and **Rouvière**, action of currents of high frequency on the secretion of urine, A., ii, 564.
- actions of currents of high frequency and high tension on urinary excretion, A., ii, 611.
- Derby, Ira H.**, devices for circulating liquids at constant temperature, A., ii, 231.
- Derby, Orville Adelbert**, mode of occurrence of topaz near Ouro Preto, Brazil, A., ii, 169.
- manganese ore deposits of Queluz, Brazil, A., ii, 558.
- Deriu, A.**, pharmacological researches on some cyanopyridone derivatives, A., ii, 328.
- Derôme, Juvénal**, properties of alkyl derivatives of ethyl cyanoacetonedicarboxylate; action of cyanogen chloride on methyl acetonedicarboxylate, A., i, 313.
- Descudé, Marcel**, action of acid chlorides on ethers in presence of zinc chloride, A., i, 357.
- action of acid chlorides on aldehydes in the presence of zinc chloride, A., i, 504.
- action of benzoyl chloride on trioxymethylene in presence of zinc chloride, A., i, 644.
- Desgrez, Alexandre**, and **Aly Zaky**, influence of lecithins in the egg in nutritive exchanges, A., ii, 518.
- Desmots, H.** See **Charles Moureu**.
- Devaux, Henri**, fixation of metals by cell walls, A., ii, 571.
- Dewar, James**, boiling point of liquid hydrogen, determined by hydrogen and helium gas thermometers, A., ii, 308.
- physical properties of liquid and solid hydrogen. Separation of free hydrogen and other gases from air. Experiments on the liquefaction of helium at the melting point of hydrogen. Pyroelectricity, phosphorescence, &c., A., ii, 597.
- Dewar, James.** See also **George Downing Living.**
- Dickinson, Cyril.** See **Thomas S. Patterson.**
- Dickson, J. Campbell**, electrical deposition of copper, A., ii, 159.
- Dieckmann, Wilhelm**, [in part with **A. Groeneveld**], cyclic β -ketonecarboxylic esters, A., i, 539.
- Diels, Otto**, fluorene, I., A., i, 521.
- Diepolder, Emil**, base from N-methyltriphenoxazinephenazonium salts (N-methyltriphenazinooxazinecarbazole), A., i, 618.
- Dieselhorff, Arthur**, melonite, A., ii, 393.
- Diesselhorst, H.** See **Wilhelm Jaeger.**
- Dieterich, Karl**, analysis of wax, A., ii, 139.
- evaluation of gum arabic, A., ii, 584.
- Dieterici, Konrad**, relation between osmotic pressure and osmotic work, A., ii, 439.
- Dietschy, Richard.** See **Rudolf Nietzki.**
- Dietz, Rudolf, Robert Funk, J. von Wrochem**, and **Franz Mylius**, solubility of some salts in water, A., ii, 104.
- Dietz, Rudolf.** See also **Franz Mylius.**
- Diller, E.**, and **Stanislaus von Kostanecki**, synthesis of luteolin, A., i, 476.
- Dilthey, Walther**, dry distillation of the salts of fatty acids, A., i, 498.
- Dimroth, Otto**, action of nitric acid on anthracene, A., i, 197.
- Dimroth, Otto**, and, in part, **Hermann Ilzhöfer** and **Richard Metzger**, direct introduction of mercury into aromatic compounds, A., i, 439.
- Dinklage, K.** See **Alfred Werner.**
- Di Nola, E.** See **Nola.**
- Ditthorn, Fritz.** See **Friedrich N. Schulze.**
- Ditz, Hugo**, estimation of *m*-cresol in cresol mixtures, A., ii, 44.
- some reactions of cobalt and iron, and the influence of alcohols and other organic substances on the electrolytic dissociation of salts in aqueous solution, A., ii, 222, 284.
- formation and composition of bleaching powder, A., ii, 239.
- estimation of cresol, A., ii, 289.
- estimation of chlorate in electrolytic bleaching solutions and potassium chlorate lyes, A., ii, 687.
- qualitative detection of small quantities of nickel in the presence of cobalt, A., ii, 694.
- Divers, Edward**, and **Tamemasa Haga**, nitrosulphates, T., 1093; P., 1901, 164.
- Divers, Edward**, and **Masataka Ogawa**, ammonium and other imidosulphites, T., 1099; P., 1900, 113; 1901, 163.
- Dixon, Augustus Edward**, interaction of urethanes and primary benzenoid amines, T., 102; P., 1900, 207.
- a form of tautomerism occurring amongst the thiocyanates of electro-negative radicles, T., 541; P., 1901, 50.

- Dixon, Augustus Edward**, halogen-substituted thiosinamines, T., 553; P., 1901, 49.
- Dixon, Walter E.**, composition and action of orchitic extracts, A., ii, 259.
- Dobbie, James Johnstone, Alexander Lauder, and Photios G. Paliatseas**, the alkaloids of *Corydalis cava*: conversion of corybulbine into corydaline, T., 87; P., 1900, 205.
- Dobbie, James Johnstone**. See also *Walter Noel Hartley*.
- Dobbin, Leonard**, interaction of potassium permanganate and alkali thiosulphates in neutral solutions, A., ii, 311.
- solubility of barium sulphate in solution of sodium thiosulphate, A., ii, 348.
- Dobroserdoff, D.**, hexahydrate of the double iodide of manganese and mercury, A., ii, 103.
- nona-hydrated double iodide of mercury and lithium, A., ii, 160.
- modifications of mercuric iodide, A., ii, 509.
- double salts of mercuric iodide with the iodides of nickel and cobalt, A., ii, 510.
- types of double salts of mercuric iodide with iodides of metals of different valencies, A., ii, 510.
- Doebner, Oscar [Gustav]**, synthesis of fumaric acid from glyoxylic and malonic acids, A., i, 188.
- Doebner, Oscar, and Simon Gärtner**, compounds of glyoxylic acid with guanidine and aminoguanidine, A., i, 261, 630.
- Doebner, Oscar, and G. Glass**, glyoxylic acid, A., i, 629.
- Doebner, Oscar, and A. Wolff**, sorbic acid, A., i, 578.
- Doht, Walther**. See *Alfred Stock*.
- Domke, J., and H. Harting**, [with *F. Plato*], density, expansion and capillarity of aqueous sucrose solutions, A., i, 189.
- Donath, Edward**, some cobalt reactions, A., ii, 389.
- precipitation of certain metallic sulphides with sodium thiosulphate, A., ii, 424.
- Donath, P.** See *Franz Kunckell*.
- Donnan, Frederick George**, theory of colloidal solution, A., ii, 439.
- Dootson, Frederick William**. See *William James Sell*.
- Doran, Robert Elliott**, the action of lead thiocyanate on the chlorocarbonates. Part II. Carboxymethyl- and carboxy-amyl-thiocarbimides and their derivatives, T., 906; P., 1901, 130.
- Dorp, Willem Arne van, and P. M. van Haarst**, maleanilide, A., i, 137.
- Dowzard, Edwin**, a modification of Gutzeit's test for arsenic, T., 715; P., 1901, 92.
- Doyer van Cleeff**. See *Cleeff*.
- Drawe, Paul**, commercial copper oxide, A., ii, 508.
- Drescher, B.** See *Daniel Vorländer*.
- Drossbach, G. Paul**, cerium, A., ii, 102.
- Drost, P.** See *Theodor Zincke*.
- Drucker, Karl**, two cases of catalysis in non-homogeneous systems, A., ii, 230.
- velocity and catalysis in heterogeneous systems, A., ii, 376.
- Drucker, Karl**. See also *W. Herz*.
- Duane, William**, velocity of chemical reactions, A., ii, 440.
- Duboin, André**, reducing properties of magnesium and aluminium, A., ii, 315.
- Dubois, A.**, analysis of sour milk; preservation of milk for the purpose of analysis, A., ii, 429.
- Dubois, Raphael**, luminosity obtained with certain organic compounds, A., ii, 217.
- Dubourg, Elisée**. See *Ulysse Gayon*.
- Dubreuil, L.** See *L. J. Simon*.
- Ducceschi, V.**, nature of melanins and allied substances, A., i, 354.
- Duclert, L., and R. Sénéquier**, digestibility of dextrose, A., ii, 458.
- Ducru, O.**, ammoniacal cobalt arsenates, A., ii, 23.
- ammoniacal nickel arsenates, A., ii, 23.
- estimation of arsenic, A., ii, 73.
- estimation of arsenic as ammonium magnesium arsenate, A., ii, 125.
- ammoniacal arsenates of cobalt and nickel; application in the estimation of arsenic, A., ii, 243.
- Duden, Paul, and D. Heynsius**, a characteristic fission of the pyrrole ring, A., i, 747.
- Düll, Ernst**, minerals [garnet] from the Fichtelgebirge, A., ii, 113.
- Dünkelsbühler, Julius**, hydrindene, A., i, 44.
- Dufau, Émile**, magnesium aluminate, A., ii, 553.
- Dufet, Henri**, ceruleite, a new mineral, A., ii, 64.
- Dugast, J.**, carob, A., ii, 683.
- Duhem, Pierre**, liquefaction of a mixture of two gases; composition of the liquid and of the vapour, A., ii, 227.
- vaporisation of binary mixtures, A., ii, 372.
- Dumont, J.**, absorption of monocalcium phosphate by arable soil and humus, A., ii, 274.

- Dunstan, Wyndham Rowland, and Harold Brown**, the alkaloid of *Hyoscyamus muticus* and of *Datura Stramonium* grown in Egypt, T., 71; P., 1900, 207.
- Dunstan, Wyndham Rowland, and Ernest Goulding**, the action of alkyl haloids on aldoximes and ketoximes. Part II. Alkylated oximes and iso-oximes, and the constitution of aliphatic oximes, T., 628; P., 1901, 84.
- the supposed existence of two isomeric triethyloxamines, T., 641; P., 1901, 85.
- Dunstan, Wyndham Rowland, and Thomas Anderson Henry**, nature and origin of the poison of *Lotus arabicus*, A., i, 39, 647.
- Dunstan, Wyndham Rowland**. See also *John Theodore Cash*.
- Duparc, Louis, and Francis Pearce**, koswite, a new pyroxenite from the Urals, A., ii, 298.
- dunite from Koswinsky-Kamen, Urals, A., ii, 664.
- Dupont, C.** See *Pierre Paul Dehéraïn*.
- Dupouy, R.**, arsenic triiodide, A., ii, 17.
- Dupré, Louis W.**, estimation of foreign volatile components of explosives containing nitroglycerol, A., ii, 582.
- Durand, Huguenin & Co., and Philippe Barbier**, ianthone; a condensation product of mesityl oxide and lippial or citral, A., i, 727.
- Dustin, Guy K.** See *Henry Lord Wheeler*.
- Dutoit, M.** See *W. Feuerstein*.
- Duyk, Mauriee**, source of error in the permanganate (Kubel-Tiemann) process for estimating organic matter in potable water, A., ii, 351.
- Dyer, Bernard**, chemical study of the phosphoric acid and potash contents of the wheat soils of Broadbalk field, Rothamsted, A., ii, 339.
- some analyses of pure oatmeal, A., ii, 481.
- Dyer, Charles Stanley**. See *William Arthur Harrison Naylor*.
- Dzierzowski, S., and Sergei Salaskin**, formation of ammonia by the action of trypsin and pepsin on proteids, A., ii, 666.
- E.**
- Earle, Richard E.** See *Charles Loring Jackson*.
- Eason, J.** See *Diarmid Noël-Paton*.
- Easterfield, Thomas Hill, and Bernard Cracroft Aston**, tutu. Part I. Tutin and coriamyrtin, T., 120; P., 1900, 211.
- Ebeling, A.**, potassium thiocyanate as indicator in the reduction of ferric to ferrous salts, A., ii, 424.
- Eberhard, Otto**, formation of chloroform from lactic acid, A., i, 357.
- Ebers, A.** See *Theodor Posner*.
- Ebert, Gustav, and Baptist Reuter**, derivatives of 1-phenyl-2:3-dimethyl-5-pyrazolone (antipyrine), A., i, 294.
- Ecalles, H.**, estimation of aconitine in preparations of aconite, A., ii, 707.
- Eckles, C. H.**, estimation of fat in creams, A., ii, 137.
- Edinger, Albert**, sulphur derivatives of aromatic amines, A., i, 166.
- Edinger, Albert, and W. Arnold**, acridine, I., A., i, 753.
- Edinger, Albert, and Paul Goldberg**, iodination of alkylbenzenes, A., i, 22.
- bromination of alkylbenzenes, A., i, 23.
- Edinger, Albert, and A. Schumacher**, iodo-derivatives of quinoline, isoquinoline, and 1-methylquinoline, A., i, 46.
- Egidi, U.** See *Clemente Montemartini*.
- Ehrenfeld, R.** See *Josef Habermann*.
- Ehrström, Robert**, a new histon from fish-sperm, A., ii, 401.
- Eibner, Alexander**, halogen-substituted aminomercaptans, A., i, 321.
- study of aldehydes: compounds of Schiff's bases with sulphurous acid and the alkali hydrogen sulphites, A., i, 376.
- *o*-toluquinaldine [2:8-dimethylquinoline], a correction, A., i, 611.
- the supposed existence of Miller and Plüch's stereoisomeric anil compounds [constitution of Eckstein's ethylideneaniline], A., i, 640.
- Eibner, Alexander, and O. Lange**, constitution of quinophthalone and the two isomeric quinophthalines, A., i, 348.
- Eibner, Alexander, and Frz. Peltzer**, stereoisomeric Schiff's bases, A., i, 97.
- Eibner, Alexander, and Georg Purucker**, conversion of anil compounds of isovaleraldehyde into A. W. von Hoffmann's corresponding alkyl-substituted ethylene bases, A., i, 168.
- Eibner, Alexander, and Fr. A. Senf**, an additive reaction of nitriles, A., i, 166.
- Eibner, Alexander, and E. Simon**, constitution of *p*-toluquinophthalone [*p*-methylquinophthalone], A., i, 611.
- Eichhorn, Otto**, modification of Hübl's method of estimating the acid and saponification numbers of wax, A., ii, 48.

- Eichler, Josef.** See **Friedrich Kehrman.**
- Eidmann, Wilhelm,** and **Ludwig Moeser,** formation of magnesium nitride by heating magnesium in air, A., ii, 240.
- Eifer, L.** See **August Michaelis.**
- Eijk, C. van,** formation of mixed crystals of thallium nitrate and thallium iodide, A., ii, 19.
- Einhorn, Alfred,** and **Richard Escales,** carbonylhydrazides of the dihydroxybenzenes, A., i, 652.
- Einhorn, Alfred,** and **Hermann Pfeiffer,** dialcylide, A., i, 712.
- Einstein, Albert,** deductions from capillary phenomena, A., ii, 228.
- Eitner, Paul,** and **Gustav Keppeler,** estimation of phosphorus and sulphur in acetylene and other combustible gases, A., ii, 689.
- Ekecrantz, Thor,** constitution of the oxime hydrochlorides, A., i, 277.
- Ekenstein, Alberda van.** See **Alberda van Ekenstein.**
- Elbs, Karl,** electro-chemical reduction of mononitro-compounds in slightly alkaline solutions, A., i, 74.
- Elbs, Karl,** and **F. Fischer,** plumbic sulphate, A., ii, 99.
- Elbs, Karl,** and **Fritz Foerster,** electrolytic synthesis of organic substances, A., i, 109.
- Elbs, Karl,** and **B. Schwarz,** azo-derivatives of *o*-nitro-*p*-toluidine, A., i, 619.
- Elbs, Karl,** and **F. Silbermann,** electro-chemical reduction of aromatic mononitro-compounds to amines, A., i, 459.
- Elias, Curt,** formalinsulphuric acid as a reagent for alkaloids, A., ii, 630.
- Ellinger, Alexander,** cantharidin and cantharidin-immunity, A., ii, 180.
- Ellis, Thomas Flower,** obituary notice of, T., 872.
- Ellms, Joseph W.,** and **Jay C. Beneker,** estimation of carbon dioxide in water, A., ii, 627.
- Eltschaninoff, E.** See **Pavel Iv. Petrenko-Kritschenko.**
- Emden, Gustav,** detection of cystin and of cystein in the decomposition products of proteids, A., i, 491.
- Emelianoff, (Miss) A.** See **(Miss) A. Serdobinsky.**
- Emerson, Benjamin Kendall,** [enstatite from Massachusetts], A., ii, 250.
- Emerson, William Henry,** abrasive efficiency of corundum, A., ii, 61.
- Emich, Friedrich,** [with **Heinrich Wal-land,** and **V. von Cordier,**] inflammability of thin layers of explosive gases, III., A., ii, 150.
- Emmerling, Adolph, C. Weber, Fr. Bachér,** and **H. Hilbert,** composition of grasses from different meadows, A., ii, 186.
- Emmerling, Oskar,** synthetic action of yeast maltase, A., i, 258, 624.
- Ende, Carl L. von,** behaviour of lead salts in solution, A., ii, 241.
- Engelen, Alph. van,** estimation of organic nitrogen by the processes of Kjeldahl and Will and Varrentrap, A., ii, 343.
- Engelen, Alph. van,** and **P. Wauters,** butter fat, A., ii, 36.
- Engelhardt, A. N.,** phosphorite and green manure, A., ii, 276.
- Engelhardt, Max,** fat of human blood, A., ii, 665.
- Engler, Carl,** and **E. Albrecht,** petroleum in fossiliferous limestone from Baden, A., ii, 662.
- Engler, Carl,** and **Wilhelm Frankenstein,** the rendering active of oxygen, VII., A., i, 657.
- Enklaar, J. E.,** influence of acids on the solubility of salts containing the same ion, A., ii, 494.
- Ephraim, Fritz,** synthesis of indacene derivatives, A., i, 688.
- Epstein, Stanislaus,** lactic acid fermentation and its practical use, A., ii, 119.
- Eras, K.** See **Franz Kunckell.**
- Erb, Walter,** compounds of certain proteids with hydrogen chloride, A., i, 621.
- Erben, Franz,** and **L. Ceipek,** albite from Amelia, Virginia, A., ii, 169.
- Erdmann, Ernst,** oil of jasmine-blossoms, A., i, 601.
- Erdmann, Ernst,** and **Hugo Erdmann,** oil of neroli, A., i, 601.
- — — methyl anthranilate, A., i, 709.
- Erdmann, Hugo,** conversion of derivatives of anthranilic acid into indigo, A., i, 536.
- — — action of formaldehyde on methyl *o*-aminobenzoate, A., i, 591.
- — — the standard of atomic weights, A., ii, 379.
- Erdmann, Hugo.** See also **Ernst Erdmann.**
- Ericson-Aurén, T.,** rate of solution of zinc in acids, A., ii, 451.
- Erlanger, Joseph,** and **Albion Walter Hewlett,** metabolism in dogs with shortened small intestine, A., ii, 609.
- Erlenmeyer, Emil, jun.,** partial conversion of 'phenyloxyacrylic acid' into phenylpyruvic acid, A., i, 32.
- — — analogies between oxygen, nitrogen, and carbon in similar linkings, A., i, 61.

- Erlenmeyer, Emil, jun.**, addition of hydrogen and other simple molecules to unsaturated compounds, A., i, 357.
 — intramolecular migration and its explanation based on the intramolecular mobility of multivalent elements, A., i, 357.
 — the benzene problem from the stereochemical standpoint, A., i, 373.
 — the closer coalescence of the multivalent atoms of molecular systems containing neighbouring double-linkings, A., i, 373.
 — condensation of pyruvic acid with benzaldehyde, A., i, 390.
- Erlenmeyer, Emil, jun.**, and **Julius Kunlin**, synthesis of *r*-leucine, A., i, 468.
- Ernst, Carl**, catalysis of electrolytic gas by colloidal platinum, A., ii, 495.
- Ernyei, Edmund**, hydrogen telluride, A., ii, 94.
- Errera, Giorgio**, condensation of cyanoacetamide with chloroform, A., i, 43.
 — mixed methenyl compounds. III. Action of ethyl ethoxymethylenacetate on cyanoacetamide. A., i, 43.
- Errera, Giorgio**, and **F. Perciabosco**, action of halogens on ethyl sodio-cyanoacetate, A., i, 18.
- Errera, Leo**, magnetism and atomic weight, A., ii, 83.
 — the "myriotone" as unit in osmotic measurements, A., ii, 375.
- Escales, Richard**. See **Alfred Einhorn** and **Johannes Thiele**.
- Esch, E.**, rocks from the volcano of Etinde, Cameroons, A., ii, 322.
- Étard, Alexandre [Léon]**, breaking down of albuminoids or protoplasmides, A., i, 490.
 — chemical nature of the tissues, A., ii, 563.
- Euler, Hans**, theory of chemical catalytic action, A., ii, 57, 376.
 — equilibrium between ester, water, acid, and alcohol, A., ii, 307.
 — inversion of cane sugar, A., ii, 441.
 — catalysis. III. Theory of contact action, A., ii, 495.
- Euler-Chelpin, H. von**. See **Jacobus Henricus van't Hoff**.
- Evans, John William**, alteration of pyrites by underground water, A., ii, 167.
 — monchiquite from Mount Girnar, India, A., ii, 456.
- Evans, Robert C. T.** See **Frederick Daniel Chattaway**.
- Eve, F. C.**, effect of temperature on the activity of the upper cervical ganglion, A., ii, 178.
- Ewers, Erich**. See **Julius Tröger**.
- Exner, Sigm.**, the absorption of artificially coloured fats, A., ii, 403.
- Eydmann, F. H., jun.**, temperature of ignition of phosphorus, A., ii, 312.
- Eyre, John Vargas**. See **Raphael Meldola**.
- Eyre, William**. See **George Young**.

F.

- Faber, E.** See **Alexander Tschirch**.
- Fabris, Guido**, analysis of fruit essences, A., ii, 49.
- Fages**, detection of chlorates and bromates by the use of strychnine, A., ii, 191.
- Fahrenheitz**. See **Conrad von Seelhorst**.
- Fahrenheit, Johannes**, dolomite [ankerite] from Magdeburg, A., ii, 248.
- Fairbanks, Harold W.**, [mineral analyses], A., ii, 168.
- Fairley, Thomas**, arsenic estimations relating to malt kilns, A., ii, 577.
- Falta, W.**, formation of carbamide by the oxidation of physiological nitrogenous substances by means of permanganate in acid solution, A., ii, 705.
- Fanara, S.** See **Francesco Angelico**.
- Farbenfabriken vorm. F. Bayer & Co.**, preparation of alkyl and aryl carbonates, A., i, 662.
 — alkyl carbonates, A., i, 662.
 — carbonates of the secondary alcohols, A., i, 662, 663.
 — 8 : 8'-dihydroxy-2 : 2'-dinaphthylamine-6 : 6'-disulphonic acid, A., i, 696.
 — chlorocarbonates of alcohols, phenols, and their derivatives, A., i, 697.
 — 2 : 3-dicyanoquinol, A., i, 699.
 — alkyl carboxyanthranilates from phthalimide derivatives containing halogen radicals attached to nitrogen, A., i, 709.
 — alkyl acetylphenylglycine-*o*-carboxylates, A., i, 709.
 — condensation products of the haloaldehydes of hydroxytolualdehyde and hydroxytoluic acid with the phenols, A., i, 712.
 — preparation of condensation products from substituted hydroxybenzyl haloids and amines, A., i, 713.
 — halogen-methyl derivatives of the aromatic aldehydes, A., i, 727.
 — transformation of anthraquinones and anthraquinoneimides into hydroxyanthraquinones and aminohydroxyanthraquinones, A., i, 729.
 — colouring matters of the phenylanthracene series, A., i, 729.

- Farbenfabriken vorm. F. Bayer & Co.**, preparation of anthracene derivatives containing a halogen radicle in the meso-ring, A., i, 729.
- [p-diaminochrysazinsulphonic acid], A., i, 760.
- [diaminodihydroxyanthraquinonesulphonic acid], A., i, 760.
- preparation of [potassium] permanganate by means of ozone, A., ii, 658.
- Farbwerk Mühlheim vorm. A. Leonhardt & Co.**, ω -cyanomethylanthranilic acid (nitrile of phenylglycine-*o*-carboxylic acid), A., i, 709.
- neutral esters of phenylglycine-*o*-carboxylic acid, A., i, 710.
- phenylglycine-*o*-carboxylic acid from anthranilic acid, A., i, 710.
- Farbwerke vorm. Meister, Lucius, and Brüning**, preparation of dinitronaphthalenesulphonic acids, A., i, 687.
- tetrahydrobenzylamine derivatives, A., i, 691.
- hydroxyhexahydrobenzylamine derivatives, A., i, 692.
- preparation of indigotin and its N-alkyl derivatives, A., i, 714.
- phthalic acid colouring matters of the naphthalene series, A., i, 734.
- di-*p*-substituted diphenylamine derivatives with free ortho-positions, A., i, 755.
- 4 : 4'-diaminodiphenylamine-3'-sulphonic acid, A., i, 766.
- Farmer, Robert Crosbie**, a new method for the determination of hydrolytic dissociation, T., 863 ; P., 1901, 129.
- Farmer, Robert Crosbie**. See also *Percy Faraday Frankland*.
- Farrington, Oliver Cummings**, new mineral occurrences [inesite], A., ii, 65.
- Favrel, G.**, action of methylacetylacetone and ethylacetylacetone on diazochlorides, A., i, 167.
- action of ethereal alkyleanoacetates on diazonium chlorides, A., i, 363.
- action of alkylmalonic esters on diazonium chlorides, A., i, 621.
- Fay, Henry, and Edward North**, nature of lead amalgams, A., ii, 240.
- Feigin, J.** See *Carl Adam Bischoff*.
- Feist, Franz**, conversion of coumalic acid into an isomeride of dehydromucic acid, A., i, 557.
- Feist, Karl**, nitrostilbazoles, A., i, 290.
- Feliciani, G.** See *Giovanni Giorgis*.
- Fendler, Georg**, the constituents of cascarilla oil, A., i, 219.
- Fendler, Georg**. See also *Hermann Thoms*.
- Fenton, Henry John Horstman**, note on the sugars of cellulose, P., 1901, 166.
- Fenton, Henry John Horstman, and (Miss) Mildred Gostling**, the action of hydrogen bromide on carbohydrates, T., 361 ; P., 1901, 22.
- derivatives of methylfurfural, T., 807 ; P., 1901, 119 ; discussion, P., 119.
- Fenton, Henry John Horstman, and Humphrey Owen Jones**, relationships of oxalacetic acid, T., 91 ; P., 1900, 205.
- note on a method for comparing the affinity values of acids, P., 1901, 24 ; discussion, P., 26.
- Fenyvessy, Béla von**, physiological action of certain isomeric hydroxyquinolines, A., ii, 31.
- Férré, Jules**, new method of preparing ferrous oxide, A., ii, 513.
- electrolytic chromium, A., ii, 513.
- a new oxide of chromium, CrO, A., ii, 513.
- a new hydrate of chromium sesquioxide, Cr₂O₃.H₂O, A., ii, 513.
- chromium nitride, A., ii, 514.
- uranium amalgam and pyrophoric uranium, A., ii, 514.
- Fernbach, Aug.**, tannase, A., i, 179.
- Ferrand, Lucien**, dichlorinated *o*-xylenes, A., i, 636.
- Ferraro, Annibale**, detection of ammonia by mercuric chloride, A., ii, 192.
- Ferreira da Silva, Antonio Joaquim**, detection and estimation of salicylic acid in wines, A., ii, 291.
- sensibility of the methods for the detection of salicylic acid in wines, A., ii, 585.
- Ferrero, Efisio**, internal friction of solutions of chrome alum, A., ii, 494.
- Ferrier, Calixte**, examination of glycerol, A., ii, 203.
- Ferro, A. A.**, sphærocobaltite from Libiola, Italy, A., ii, 395.
- Fest, A.** See *Georg Baumert*.
- Feuerstein, W.**, 3 : 4 : 3' : 4'-tetramethoxy stilbene, A., i, 274.
- some substituted benzylideneindanones, A., i, 279.
- occurrence of maltol in the needles of the silver fir (*Abies alba*), A., ii, 526.
- Feuerstein, W., and M. Dutoit**, [and, in part, *W. Feuerstein, and Jean Wallach*], the phthalein of hydroxyquinol, A., i, 723.
- Feuerstein, W., and M. Heimann**, synthesis of acetylpiperone, A., i, 465.
- Feuerstein, W., and A. Musculus**, 2-hydroxybenzylacetophenone, A., i, 279.
- Fezer, O.** See *Otto Fischer*.

- Fichter, Fritz**, and **Sylvain Hirsch**, the β -lactone of *as*-dimethylmalic acid, A., i, 65.
- attempted synthesis of a $\gamma\delta$ -unsaturated acid, A., i, 594.
- Fichter, Fritz**, and **Werner Langguth**, $\delta\epsilon$ -hexenoic acid, A., i, 63.
- Fichter, Fritz**, and **Beda Scheuermann**, condensation products of furfuraldehyde with succinic acid, A., i, 479.
- Fichter, Fritz**, and **Heinrich Schiess**, benzylated ethyl acetonedicarboxylates, A., i, 544.
- Finckh, L.**, [fassaite from Syria], A., ii, 172.
- Finkenbeiner, Hermann**. See **Oskar Blank**.
- Flora, Paolo**, characteristic reaction of phenol, A., ii, 425.
- Fiorini, Carlo**, absorption spectra of chloroanilic and bromoanilic acids and their alkaline salts, A., ii, 367.
- Fiquet, Edmond**, nitrilophenols, A., i, 469.
- [toxicity of compounds containing both cyano- and hydroxyl groups], A., ii, 464.
- Fischer, Arthur**, electrolytic preparation of alkali metals from fused alkali chlorides, A., ii, 96.
- Fischer, Emil**, synthesis of $\alpha\delta$ -diaminovaleric acid, A., i, 191.
- esters of amino-acids, A., i, 192.
- derivatives of helicin, A., i, 275.
- synthesis of $\alpha\gamma$ -diaminobutyric acid, A., i, 674.
- production of pyrrolidine-2-carboxylic acid and of phenylalanine by the hydrolysis of egg-albumin, A., i, 745.
- synthesis of 2:6-piperidinecarboxylic acids, A., i, 746.
- hydrolysis of casein by means of hydrochloric acid, A., i, 780.
- Fischer, Emil**, and **Edward Frankland Armstrong**, synthesis of disaccharides, A., i, 189.
- isomeric acetyl halogen derivatives of dextrose, A., i, 257.
- isomeric acetyl halogen derivatives of dextrose, and the synthesis of glucosides, A., i, 671.
- Fischer, Emil**, and **Ernest Fourneau**, derivatives of glycine, A., i, 675.
- Fischer, Emil**, and **Wolf von Loeben**, heat of combustion of glucosides, A., ii, 225.
- Fischer, Emil**, and **Georg Roeder**, synthesis of thymine and other uracils, A., i, 294.
- Fischer, Emil**, and **Otto Seuffert**, indazole, A., i, 411.
- Fischer, Emil**, and **Aladar Skita**, fibroin from silk, A., i, 783.
- Fischer, F.** See **Karl Elbs**.
- Fischer, J.**, forcing plants with ether, A., ii, 335.
- Fischer, Otto**, etherification of triphenylcarbinols by alcohols, A., i, 82.
- alkaloids of *Peganum Harmala*, A., i, 405.
- Fischer, Otto**, [with **G. A. Bruhn**, and **M. von Cammerloher**], study of the isorosinduline and isorosindone reactions, A., i, 416.
- Fischer, Otto**, [with **O. Fezer**, **Ernst Fussenegger**, and **Ludwig Reindl**], iminazoles of the benzene and naphthalene series, A., i, 413.
- Fischer, Richard**, alkaloids of *Sanguinaria canadensis*, A., i, 742.
- alkaloids of *Glaucium luteum*, A., i, 743.
- alkaloids of *Eschscholzia californica*, A., i, 743.
- Fischer, Richard**. See **Hans Stobbe**.
- Fischer, Th.**, and **P. Müller**, ferricyanides of the alkali earths, A., i, 455.
- Fisher, Walter William**, alkaline waters from the chalk, A., ii, 627, 665.
- Trafalgar Square well water, A., ii, 665.
- Fittica, Friedrich**, alleged conversion of phosphorus into arsenic, A., ii, 59.
- conversion of phosphorus into antimony, A., ii, 59.
- detection of nitrogen in arsenic, and the conversion of arsenic into antimony, A., ii, 236, 313.
- composition of amorphous phosphorus, A., ii, 312.
- Fittig, Rudolph**, polymeric phenylisocrotonic acid, A., i, 145.
- Fittig, Rudolph**, [and, in part, **Oskar Gottsche**, **Tom Guthrie**, **Ernst Roth**, **Harry Salomon**, **Wilhelm Sternberg**], dilactones, A., i, 120.
- Flath, J.**, estimation of small quantities of zinc in iron-spar, A., ii, 625.
- Flatow, L.**, action of bromine and chlorine on the esters of sodiodiketo-hydrindenecarboxylic acid, A., i, 543.
- Flemming, A.** See **August Michaelis**.
- Fletcher, Lazarus**, meteoric stones which fell at Zomba, British Central Africa, A., ii, 400.
- Fleury, Gustave** [**Clement**], toxicological detection of nitric acid, A., ii, 277.
- Flink, Gustav**, [synchysite and molybdophyllite], A., ii, 663.
- Flürscheim, Bernhard**, ethyl *p*-methylbenzylidenacetate, A., i, 387.
- Flusin, G.**, osmosis of liquids across animal membranes, A., ii, 148.

- Flusin, G.**, osmosis across a membrane of copper ferrocyanide, A., ii, 439.
- Foerster, Fritz**, transformation of hypochlorites into chlorates, A., ii, 309.
- Foerster, Fritz**. See also **Karl Elbs**.
- Foerster, Otto**, value of the molybdate process when estimating the citrate-solubility of basic slag, A., ii, 576.
- Folin, Otto**, estimation of ammonia in urine, A., ii, 575.
- estimation of urea in urine, A., ii, 630.
- Folin, Otto**, and **Phil A. Shaffer**, estimation of uric acid in urine, A., ii, 585.
- Fonzes-Diacon, Henri**, cobalt selenide, A., ii, 22.
- cadmium selenide, A., ii, 60.
- copper selenides, A., ii, 100.
- Forcrand, Robert de**, vaporisation and hydration of ethylene glycol, A., i, 307.
- molecular weight of chloral hydrate at the boiling point, A., i, 668.
- sodium peroxide, A., ii, 155.
- specific heat and latent heat of fusion of ethylene glycol, A., ii, 224.
- generalisation of Tronton's law, A., ii, 372.
- thermal properties of solid hydrates of sodium hydroxide, A., ii, 593.
- thermal study of the solid hydrates of potassium hydroxide, A., ii, 593.
- molecular weight at the boiling point, A., ii, 594.
- calculation of the heat of volatilisation and heat of fusion of some elements, A., ii, 641.
- Formánek, Emmanuel**, the toxicity of expired air, A., ii, 174.
- Formánek, Julius**, colouring matter of beetroot and its absorption spectrum, A., ii, 35.
- detection of metals by the absorption spectra of their compounds with alkanna. II. Rare metals, A., ii, 128.
- absorption spectra of the colouring matters of blood, A., ii, 711.
- Formenti, Carlo**, solidification of acetone, A., i, 13.
- analysis of supposed Italian bauxites, A., ii, 557.
- Fornaro, A.** See **Fritz Ullmann**.
- Forster, Martin Onslow**, infracampholenic acid, an isomeride of campholytic and isolaunonic acids, T., 108; P., 1900, 211.
- studies in the camphane series. Part II. Nitrocamphene, aminocamphene, and hydroxycamphene, T., 644; P., 1901, 85.
- Forster, Martin Onslow**, studies in the camphane series. Part III. Action of hydroxylamine on the anhydrides of bromonitrocamphane, T., 653; P., 1901, 88.
- studies in the camphane series. Part IV. The isomerism of α -benzoylcamphor, T., 987; P., 1901, 167.
- Forster, Martin Onslow**, and **William Robertson**, preparation and properties of 2:6-dibromo-4-nitrosophenol, T., 686; P., 1901, 116.
- studies in the camphane series. Part V. Halogen derivatives of p-cymene from substituted nitrocamphanes, T., 1003; P., 1901, 169.
- Fortmann, Georg**. See **Friedrich Russig**.
- Fosse, Robert**, the supposed dinaphthylene alcohol, A., i, 322, 384.
- naphthylol-naphthyl-oxynaphthylmethane, A., i, 323.
- hydroxynaphthaldehyde or 1-methanal-2-naphthylol, A., i, 328.
- dinaphthoxanthones, A., i, 604.
- action of hydrobromic and hydrochloric acids on the so-called dinaphthylene glycol, A., i, 643.
- Fourneau, Ernest**, 3-phenyladenine, A., i, 238.
- Fourneau, Ernest**. See also **Emil Fischer**.
- Fowler, Gilbert John**, iron nitride, T., 285; P., 1900, 209.
- Fowler, Gilbert John**, and **Philip Joseph Hartog**, the heat of formation and constitution of iron nitride, T., 299; P., 1900, 210.
- Fox, John Jacob**. See **John Theodore Hewitt**.
- Fränkel, Adolf**, estimation of free phosphorus in phosphorised oils, A., ii, 423.
- Fränkel, Kurt**, dihydroisoindeole (*o*-xylylenimine), A., i, 44.
- Fränkel, Sigmund**, and **Leo Langstein**, products of the digestion of albumin. III. The so-called amphotropeptone, A., i, 575.
- Francesconi, Luigi**, and **V. Recchi**, naphthalic acid and naphthalimide, A., i, 721.
- Franchimont, Antoine Paul Nicolas**, [with Lublin], new class of nitroamines, A., i, 674.
- Franke, Adolf**, action of sodium hydroxide on α -hydroxyisobutaldehyde, A., i, 188.
- Frankenstein, Wilhelm**. See **Carl Engler**.
- Frankland, Percy Faraday**, and **Francis W. Aston**, influence of a heterocyclic group on rotatory power: the ethyl and methyl esters of dipyrromucyltartaric acid, T., 511; P., 1901, 41.

- Frankland, Percy Faraday**, and **Robert Crosbie Farmer**, liquid nitrogen peroxide as a solvent, T., 1356; P., 1901, 201.
- Frankland, Percy Faraday, Frederick Malcolm Wharton**, and **Henry Aston**, the amide, anilide, and *o*- and *p*-toluidides of glyceric acid, T., 266; P., 1901, 6.
- Franzen, H.** See **Theodor Curtius**.
- Fraprie, Frank Roy.** See **Theodore William Richards**.
- Fraps, George S.**, composition of a wood oil, A., i, 188.
- loss of sulphur in preparing ash of plants, A., ii, 421.
- estimation of pentosans, A., ii, 536.
- Fraps, George S.**, and **J. A. Bizzell**, methods of estimating proteid nitrogen in vegetable matter, A., ii, 140.
- Fraps, George S.** See also **W. A. Withers**.
- Friedricq, Léon**, cause of apnoea, A., ii, 174.
- Freer, Paul C.**, and **A. M. Clover**, constituents of Jamaica dog-wood, A., ii, 333.
- Frehse**, a new starchy product used for confitures and creams, A., ii, 536.
- French, P. R.** See **S. P. Mulliken**.
- Frentzel, Johannes**, and **Felix Reach**, the source of muscular energy, A., ii, 254.
- Frentzel, Johannes**, and **Max Schreuer**, nutritive value of flesh, A., ii, 609.
- Frerichs, Gustav**, estimation of iodoform in dressing materials, A., ii, 42.
- new method for the volumetric estimation of bismuth, A., ii, 201.
- analysis of surgical dressings, A., ii, 203.
- improvement of Küster's hydrogen sulphide apparatus, A., ii, 311.
- Frerichs, Gustav**, and **Heinrich Beckurts**, action of potassium thiocyanate on chloroacetanilides, A., i, 80.
- Frese, Hans, d**- and *l*-2-ethylpiperidine, A., i, 163.
- Fresenius, Heinrich**, water from the Kiedrich spring near Eltville, Rhine, A., ii, 66.
- Fresenius, Wilhelm**, and **Leo Grünhut**, adulteration of saffron; "saffron essence," A., ii, 211.
- Freund, Martin**, isomeric diamino-bases of α -cyanostilbene, A., i, 690.
- formation of substantive azo-dyes from di-*p*-aminophenylcyanobutadiene, A., i, 711.
- Freund, Martin**, and **Adolf Friedmann**, cytosine, A., i, 288.
- Freund, Martin**, and **Th. Paradies**, tetrazole, A., i, 770.
- Freund, O.**, detection of peptone in urine and faeces, A., ii, 710.
- Freundler, Paul**, action of acid chlorides on ethers in the presence of zinc, A., i, 445.
- phenylhydrazine phenylcarbazine, A., i, 776.
- Freundler, Paul**, and **L. Bunel**, new mode of decomposition of bisulphite derivatives, A., i, 505.
- Freyss, Georges**, nitro-derivatives of *o*-anisidine, A., i, 321.
- Frič, V.** See **Emil Votoček**.
- Fricke, Ernest**, plants containing zinc, A., ii, 34.
- Friebel, Georg**, and **Berthold Rassow**, hydrazo-compounds; reduction products of *o*- and *p*-nitrodiphenyl and the products of the transformation of hydrazodiphenyls, A., i, 574.
- Fried, G. A.**, and **William J. Gies**, does muscle contain mucin? A., ii, 255.
- Friedel, Georges**, termierite and lassallite, two new silicates, A., ii, 397.
- Friedel, Jean**, influence of pressure on chlorophyllous assimilation, A., ii, 267.
- chlorophyllous assimilation without living organisms, A., ii, 411.
- Friedjung, Ernst**, and **Gustav Mossler**, condensation of isobutaldol with aniline, A., i, 641.
- Friedjung, Josef K.** See **Adolf Jolles**.
- Friedländer, Jacob**, remarkable phenomena in the neighbourhood of the critical point of partially miscible liquids, A., ii, 643.
- Friedmann, Adolf.** See **Martin Freund**.
- Friend, G. Clausen**, and **Edgar Francis Smith**, atomic weight of antimony, A., ii, 604.
- Fritchle, Oliver P.**, analysis of uranium and vanadium ores, A., ii, 200.
- Fritsch, Paul**, a new method of preparing *p*-alkyloxybenzylanilines and their homologues, A., i, 268.
- Fromm, Emil**, and **Georg Mangler**, ethenyltrisulphide [tetraethenyl hexa-sulphide] and its derivatives, A., i, 184.
- Fromm, Otto**, evaluation of gum arabic, A., ii, 426.
- Frouin, Albert**, digestive power of gastric juice, A., ii, 561.
- Frouin, Albert**, and **M. Molinier**, action of alcohol on the gastric secretion, A., ii, 402.
- Fruwirth, C.**, and **W. Zielstorff**, autumnal return of substance in hops, A., ii, 185.
- Fuchs, F.** See **Hans Buchner**.
- Fürth, Otto von**, metabolism in Cephalopods, A., ii, 115.

- Fürth, *Otto von*, proteids of invertebrate muscle, A., ii, 117.
 Fuld, *E.*, and *Karl Spiro*, the rennet and anti-rennet-like action of blood, A., ii, 67.
 Fulda, *Hugo Ludwig*, 3-*p*-toluoyl-picolinic acid and the products of its oxidation, A., i, 226.
 Fulweiler, *W. H.*, and *Edgar Francis Smith*, precipitation and separation of silver by electrolysis, A., ii, 692.
 Funcke, *R.* See *Friedrich Krafft*.
 Funk, *Robert*. See *Rudolf Dietz*.
 Fussenegger, *Ernst*. See *Otto Fischer*, and *Wilhelm von Miller*.

G.

- Gabler, *M.* See *Ludwig Wolff*.
 Gabriel, *Siegmund*, pyrimidine from barbituric acid, A., i, 168.
 Gabriel, *Siegmund*, and *James Colman*, syntheses in the purine group, A., i, 427.
 Gabrielli, *Fausto*, nutritive value of orange residues in Calabria, A., ii, 71.
 Gabutti, *Emilio*, bromal acetate, acetyl-bromal chloride and bromide, A., i, 11.
 — action of alcohols on chloral, A., i, 367.
 Gabutti, *Emilio*, and *G. Bargellini*, bromide and iodide of acetylchloral, A., i, 366.
 Gadamer, *Johannes*, dextrorotatory sec.-butylamine, A., i, 582.
 — relation of hyoscyamine to atropine and of scopolamine to *i*-scopolamine, A., i, 605.
 Gadamer, *Johannes*, and *D. Bruns*, corybulbine, A., i, 288.
 Gaertner, *Gustav*, new instrument for the estimation of the amount of hæmoglobin in blood, A., ii, 712.
 Gärtner, *Simon*. See *Oscar Doeberner*.
 Gailhat, *J.*, modification of the manganimetric method, A., ii, 420.
 Galimard, *J.*, action of bromine on cinchouidine; two isomeric α - and β -dibromocinchonidines, A., i, 162.
 Galli-Valerio, *Bruna*, and *Casimir Strzyzowski*, biological test for arsenic, A., ii, 194.
 Galloni, *M.* See *C. Manuelli*.
 Gamel, *G.*, excretion of oxygen compounds of phosphorus, A., ii, 610.
 Gamgee, *Arthur*, behaviour of oxyhæmoglobin, carbon monoxide hæmoglobin, methæmoglobin, and certain of their derivatives in the magnetic field, with a preliminary note on the electrolysis of the hæmoglobin compounds, A., i, 782.
 Gamper, *M.* See *C. Hartwich*.
 Ganike, *A. E.*, apparatus for the auto-regulation of combustion in organic analysis, A., ii, 195.
 Gansser, *Aug. W. E.* See *Robert Gnehm*.
 Garben, *E.* See *Emil Besthorn*.
 Garelli, *Felice*, and *Vittorio Bassani*, cryoscopic experiments with the bromides of arsenic and antimony, A., ii, 373.
 — cryoscopic experiments with methylene iodide, A., ii, 541.
 Garner, *W. W.* See *Ira Remsen*.
 Garnier, *Léon*. See *M. Lambert*.
 Garrard, *Charles Cornfield*, decomposition-potentials of fused and solid electrolytes, A., ii, 54.
 Garrard, *Charles Cornfield*, and *E. Oppermann*, hydration of dissolved substances, A., ii, 13.
 Garrett, *Frederick Charles*, and *John Armstrong Smythe*, the bases contained in Scottish shale oil, P., 1900, 190.
 Garrigou, *F.*, preliminary operations at the spring for the detection of metals present in minute quantities in natural waters, A., ii, 75.
 Garrod, *Archibald Edward*. See *Kennedy Joseph Previte Orton*.
 Garsed, *W.*, characters of oil of akee, A., ii, 136.
 Garsed, *W.*, and *John Norman Collie*, on the estimation of cocaine and on cocaine hydriodide periodide, T., 675; P., 1901, 89.
 Gartzon, *P. von*. See *Bernhard Kühn*.
 Gassel, *Estimation of calcium in water*, A., ii, 133.
 Gaus, *W.*, influence of neutral salts on the tension of ammonia in aqueous solutions, A., ii, 7.
 Gautier, [*Émile Justin*] *Armand*, origin of atmospheric hydrogen, A., ii, 14.
 — production of nitrogen compounds in volcanoes, A., ii, 63.
 — volume of hydrogen evolved by the action of acids on granite. A correction, A., ii, 92.
 — gaseous products liberated by the action of heat on some igneous rocks, A., ii, 171.
 — production of hydrogen in igneous rocks. Action of steam on ferrous salts, A., ii, 171.
 — combustible gases of the atmosphere: atmospheric hydrogen, A., ii, 232.
 — estimation of sulphides, hydrosulphides, polysulphides, and thiosulphates existing together in solutions and particularly in sulphuretted mineral waters, A., ii, 277.

- Gantier**, [*Émile Justin*] *Armand*, origin of hot sulphuretted waters: thio-silicates and oxysulphides derived from natural silicates, A., ii, 322.
— presence of nitrides, argonides, arsenides, and iodides in the crystalline rocks, A., ii, 399.
- Gautier**, *Armand*, *Allyre Chassevant*, and *Louis Magnier de la Source*, dilution of wine and its detection, A., ii, 353.
- Gayon**, *Ulysse*, and *Elisée Dubourg*, a ferment which produces mannitol, A., i, 784.
- Gengou**, *O.*, origin of the alexin of normal [blood] serums, A., ii, 256.
- Genvresse**, *P.*, new preparation of terpineol, A., i, 280.
— new alcohol derived from limonene, A., i, 281.
- Georgievics**, *Georg von*, and *L. Springer*, behaviour of the dyes obtained from the sulphonic acids of α -naphthylamine and β -naphthol with sheep's wool, A., i, 239.
- Georgievics**, *Georg von*, [and in part, with *Eduard Valenta*], azo-dyes from β -naphthol and the monosulphonic acids of α -naphthylamine, A., i, 239.
- Georgs**, *N.* See *Conrad von Seelhorst*.
- Gérard**, *Ernest*, conversion of creatine into creatinine by a soluble dehydrating ferment in the organism, A., ii, 178.
- Gerb**, *L.* See *Alfred Werner*.
- Gerbert**, *S.* See *Carl Adam Bischoff*.
- Gerbido**, *Marek*, chemical study of seed mangolds, A., ii, 337.
- Geret**, *L.* See *Hans Buchner* and *Martin Hahn*.
- Gerin**, *F.* See *Léo Vignon*.
- Gerlach**, *Max*, feeding experiments with molasses and maize-germ molasses, A., ii, 337.
— plot experiments at Jersitz-Posen in 1898—1899 and 1899—1900, A., ii, 416.
— estimation of the manurial requirements of typical soils, A., ii, 417.
— effect of various carbonaceous compounds on the amount of nitrogen in soil, and on the development of plants, A., ii, 574.
— value of nitrogen in horn-meal as compared with nitric nitrogen, A., ii, 574.
- Gerlach**, *Max*, and *Vogel*, albumin-forming bacteria, A., ii, 675.
- Gerlach**, *Max*. See also *Krenz*.
- Geroch**, *J. E.*, ferriisalicylic acid as an acidimetric indicator, A., ii, 190.
- Geuther**, *Theodor*, modification of Wel-mans' reaction, A., ii, 48.
- Gibb**, *Allan*, estimation of arsenic and antimony in cupreous materials, A., ii, 345.
- Gibson**, *Harriet Winfield*. See *Hermann T. Vulté*.
- Giemsa**, *G.*, compounds of glycuronolactone, A., i, 11.
- Gies**, *William J.*, excretion of kynurenic acid, A., ii, 407.
— artificial parthenogenesis, A., ii, 665.
- Gies**, *William J.* See also *G. A. Fried*, *P. B. Hawk*, *J. E. Kirkwood*, *L. D. Mead*, *A. N. Richards*, and *G. W. Vandergrift*.
- Giesel**, *Fritz*, radioactive substances, A., ii, 99.
- Gigli**, *Torquato*, spontaneous conversion of uric acid into carbamide, A., i, 677.
- Giglioli**, *Italo*, cultivation of wheat, A., ii, 527.
- Gilbody**, *Alexander William*, and *Charles H. G. Sprankling*, the influence of the methyl group on ring formation, P., 1900, 224.
- Gilbody**, *Alexander William*, *William Henry Perkin, jun.*, and *J. Yates*, brazilin and hæmatoxylin, T., 1396; P., 1899, 27, 75, 241; 1900, 105.
- Giles**, *William B.*, potassium and sodium thiocyanates and a blue colour produced by heating them, A., i, 262.
- Gillner**, *H. von*. See *Oscar Kellner*.
- Gillot**, *Henri*, decomposition of normal ammonium oxalate, A., i, 118.
— influence of the nature and intensity of light on the inversion of sucrose by mineral acids, A., i, 127.
— hydrolysis and utilisation of raffinose by *Penicillium glaucum*, A., ii, 121.
- Giorgis**, *Giovanni*, and *G. Feliciani*, technical analysis and softening of feed-water for boilers, A., ii, 581.
- Girard**, [*Antoine*] *Charles*, utilisation of gorse, A., ii, 187.
- Girard**, *C.*, and *Fred. Bordas*, analysis of travertine from Vichy, A., ii, 561.
- Girardet**, *Fernand*, a simple ureometer, A., ii, 362.
- Giustiniani**, *Ercole*, humidity of soils and denitrification, A., ii, 569.
- Glaessner**, *Karl*, zymogens of the stomach, A., ii, 666.
- Glaessner**, *Karl*, and *Leo Langstein*, origin of kynurenic acid in the organism, A., ii, 669.
- Glage**, *Friedrich*, the guaiacum test in practice, A., ii, 429.

- Glasenapp, Maximilian**, composition of the coprogenic mud of Kanger Lake in Livonia, A., ii, 37.
- Glaser, F.** See *Wilhelm Manchot*.
- Glaser, L.**, electrolytic deposition of lead from solutions, A., ii, 158.
- Glass, G.** See *Oscar Doebner*.
- Gley, Eugène.** See *Lucien Camus*.
- Glücksman, Carl**, action of Denigès' acetone reagent on terpenes, A., ii, 202.
- new method of testing "saccharin," A., ii, 588.
- Gmeiner, M.** See *Ernst von Meyer*.
- Gnehm, Robert**, and *Aug. W. E. Gansser*, derivatives of gallamic acid, A., i, 326.
- Gnehm, Robert**, and *Thor Schentz*, alkylated aminobenzenesulphonic acids and *m*-aminophenols, A., i, 519.
- Gnezda, Julius**, formation of an isatin derivative from albumin, A., i, 780.
- Godlewski, Emil**, food requirements of cultivated plants, A., ii, 572.
- Godlewski, Emil**, and *F. Polzeniusz*, production of alcohol during the intramolecular respiration of seeds in water, A., ii, 618.
- Godshall, L. D.**, assay of cupriferous materials for gold and silver, A., ii, 42.
- Göckel, Heinrich**, flask for the estimation of carbon in iron and steel, A., ii, 39.
- Göhlisch, Wilhelm**, estimation of iron in "ferrum oxydatum saccharatum" containing a large percentage of iron, A., ii, 132.
- Goetzel-Albers, O.**, estimation of sugar in urine by Lehmann's method, A., ii, 355.
- Goldberg, Alwin**, canarin and ψ -thiocyanogen, A., i, 193.
- thiocyanogen, the so-called ψ -cyanogen and the yellow colouring matters obtained from thiocyanates, A., i, 516, 677.
- Goldberg, E. G.** See *A. W. Speransky*.
- Goldberg, Paul**, derivatives of *o*-xylylidenebiphenyl, A., i, 32.
- Goldberg, Paul.** See also *Albert Edinger*.
- Goldberger, Paul**, application of the reducing action of hyposulphurous acid, A., i, 23.
- Goldblatt, N.** See *Carl Adam Bischoff*.
- Goldhaber, Joseph.** See *Hans Jahn*.
- Goldschmidt, Carl**, action of formaldehyde on *p*-formylphenetidine, A., i, 322.
- camphoric acid phenetide, A., i, 590.
- Goldschmidt, Carl**, phenacylphenacetin, A., i, 643.
- [condensation products of] formaldehyde, A., i, 652.
- *o*-toluoyl chloride: esters of anthranilic acid, A., i, 709.
- Gomberg, Moses**, preparation of triphenylchloromethane, A., i, 77, 374.
- triphenylmethyl. An instance of tervalent carbon, A., i, 77, 319, 638, 690.
- Gomberg, Moses**, and *O. W. Voedisch*, tritoylchloromethane, A., i, 374.
- Gonnermann, Max**, value of molasses-foods, A., ii, 71.
- Goodwin, William.** See *Alfred Senier*.
- Gorazdowski, L.**, analyses of rock-forming minerals from the Tatra Mountains, A., ii, 170.
- Gordan, Paul**, and *Wladimir Alexéeff*, agreement between chemical formulæ and the theory of invariants, A., ii, 13.
- Gordan, Paul**, and *Leonhard Limpach*, some relations between physical constants and constitution in benzenoid amines. Part II., T., 1080; P., 1901, 154.
- Gordin, Harry Mann**, evaluation of medicinal drugs containing alkaloids, A., ii, 485.
- Gordin, Harry Mann.** See also *Albert B. Prescott*.
- Gore, Herbert C.** See *William McPherson*.
- Gorni, F.** See *Giuseppe Bruni*.
- Gosio, B.**, arsenic mould (*Penicillium brevicaulis*), A., ii, 182, 193.
- Gostling, (Miss) Mildred.** See *Henry John Horstman Fenton*.
- Gotthelf, August Henry**, synthesis of alkyl ketodihydroquinazolines from anthranilic acid, A., i, 764.
- Gottsche, Oskar.** See *Rudolph Fittig*.
- Goulding, Ernest.** See *Wyndham Rowland Dunstan*.
- Gouy, A.**, electrocapillary properties of mixtures, and electrocapillary viscosity, A., ii, 83.
- electrocapillary properties of some organic compounds in aqueous solution, A., ii, 435.
- electrocapillary action of non-dissociated molecules, A., ii, 592.
- Graebe, Carl**, euxanthic acid, A., i, 85.
- direct production of aromatic amines from the hydrocarbon, A., i, 523.
- preparation of chlorine from sodium chloride; preparation of phosphorus trichloride, A., ii, 309.
- Graebe, Carl**, and *S. Rostowzew*, 3:4:6-trichlorophthalic acid, A., i, 543.

- Graeger, Erdmann.** See *Hans von Pechmann*.
- Granger, Albert,** mercury iodoantimonide, A., ii, 386.
- Granichstädten, Emerich, and Friedrich Werner,** action of zinc ethyl on anhydrides of organic acids, oxides, and lactones, A., i, 518.
- Grassi-Cristaldi, Giuseppe, and F. Schiavo-Leni,** action of methylene-chlorohydrin on aromatic amines, A., i, 55.
- Grassi-Cristaldi, Giuseppe, and G. Tomarchio,** bis-*p*-dimethyl-*o*-carboxycinnamic and bisdimethylphthalic acids from the oxidation of bisdihydro-santinic acid, A., i, 35.
- Grassini, R.,** colour reaction of alcohol, A., ii, 43.
- Gray, G. Watson,** estimation of calcium in high-grade ferro-silicon, A., ii, 578.
- Gray, Thomas,** note on acetonylacetone, T., 681; P., 1901, 89.
- condensation of acetonylacetone with hydrazine hydrate, T., 682; P., 1901, 90.
- Greeley, Arthur W.,** analogy between loss of water and lowering of temperature, A., ii, 668.
- Green, Arthur George, Charles Frederick Cross, and Edward John Bevan,** the diazotype process in photographic printing, A., ii, 634.
- Greenwood, Alfred.** See *John Ryder*.
- Gregor, Adalbert,** creatinine, A., ii, 67.
- Gréhant, Nestor,** treatment of carbon monoxide poisoning by oxygen at atmospheric pressure, A., ii, 409.
- Greiss, Max.** See *August Michaelis*.
- Greshoff, Maurits,** echinopsine a new crystalline alkaloid, A., i, 338.
- Greshoff, Maurits, and J. Sack,** waxes, A., i, 445.
- Grether, E.** See *A. Bernoulli*.
- Griffiths, Arthur Bower, and N. J. Bluman,** nitrogenous bases in Roumanian petroleum, A., i, 609.
- Griffiths, Arthur Bower, and F. W. Warren,** composition of the orange pigment of *Uroster rubens*, A., i, 94.
- Griffon, Ed.,** photosynthesis and the coloration of plants, A., ii, 331.
- Grignard, Victor,** action of esters of monobasic fatty acids on mixed organo-magnesium compounds, A., i, 250.
- mixed organomagnesium compounds, A., i, 263.
- action of mixed organomagnesium compounds on naphthyl methyl ketones, A., i, 393.
- Grignard, Victor,** mixed organo-magnesium compounds and their application to the synthesis of acids, alcohols, and hydrocarbons, A., i, 679.
- Grignard, Victor.** See also *Lissier*.
- Grimaux, Edouard,** blue colouring matters derived from triphenylmethane, A., i, 269.
- red colouring matters derived from triphenylmethane, A., i, 269.
- derivatives of triphenylmethane, A., i, 269.
- preparation of *m*-alkylaminophenols, A., i, 269.
- colouring matters derived from *m*-dialkylaminoalkyloxybenzenes, A., i, 269.
- Grimaux, Edouard, and Léon Lefèvre,** new colouring matters, A., i, 268.
- Grimbert, Léon,** production of acetyl-methylcarbinol by *Bacillus tartricus*, A., ii, 328.
- Grimbert, Léon, and G. Legros,** modification of the functions of *Bacillus coli*, A., ii, 265.
- Grimmer, Joh.,** asbestos from Alilovei, district of Sauskinost, A., ii, 561.
- Grindley, Harry S., J. L. Sammis, E. F. Ladd, Isabel Bevier, and Elizabeth C. Sprague,** [dietary studies], A., ii, 518.
- Grob, Jacob.** See *Eugen Bamberger*.
- Grober, Jul. A.,** variation of the quantity of thiocyanate contained in human saliva and its causes in health and disease, A., ii, 402.
- Gröger, Max,** alkali copper carbonates, A., ii, 240.
- Groeneveld, A.** See *Wilhelm Dieckmann*.
- Grohmann, Alfred.** See *Max Busch*.
- Groll, Friedrich.** See *Richard Wolfenstein*.
- Gros, Oscar,** sensitiveness to light of fluorescein, its substituted derivatives and the leuco-bases, A., ii, 433.
- Groschuff, Erich,** isomerism in the piperidine series, A., i, 745.
- Groshans, J. A.,** isobaric aqueous solutions, A., ii, 644.
- Grothe, W.,** anilides of alkylsulphonacetic acids, A., i, 79.
- action of potassium hydrosulphide, potassium cyanide, and potassium thiocyanate on chloroacetanilides, A., i, 79.
- Grotowsky, Hans.** See *Carl Bülow*.
- Grube, Karl,** pathology of diabetic coma, A., ii, 68.
- Grünbaum, A. S.,** influence of boric acid and borax on metabolism in children, A., ii, 517.
- Grünhut, Leo.** See *Wilhelm Fresenius*.

- Grünling, Fr.**, minerals of Ceylon, A., ii, 111.
- Grüss, J.**, dependence of the production of transitory starch on temperature and on the action of oxydases. A., ii, 33.
- oxidase in yeast, A., ii, 615.
- Grützner, Bruno**, the precipitation of albumin in urine by clarifying agents, A., ii, 295.
- Grunmach, Leo**, experimental determination of the surface tension of liquid air, A., ii, 646.
- Gruyter, Paul de.** See *Eugen Bamberger*.
- Guareschi, Icilio**, [with *Silvio Baldi*, and *Carlo Mensio*], synthesis of derivatives of pyridine and of trimethylenepyrrole, A., i, 341.
- Guareschi, Icilio**, [with *Edoardo Peano*], $\beta\beta$ -dialkylglutaric and γ -cyano- β -alkylvinylacetic acids, I., A., i, 630.
- Guarnieri, P.** See *Girolamo Mazzara*.
- Gubser, Al.** See *Alfred Werner*.
- Gucci, Pietro**, isopropylphthalide, A., i, 544.
- Guépin, Henri**, cultivation of gorse, A., ii, 271.
- Guerbet, Marcel**, action of heptylic alcohol on its sodium derivative; new method for the synthesis of alcohols, A., i, 182.
- action of octyl alcohol on its sodium derivative; synthesis of di- and tri-caprylic alcohols, A., i, 307.
- action of ethyl alcohol on barium ethoxide; synthesis of *n*-butyl alcohol, A., i, 625.
- Gürich, Georg**, a diluvial boulder of nephrite in a street pavement at Breslau, A., ii, 321.
- Guérin, Gabriel**, characteristics of ovalbumin, serum-albumin (*sérines*), and serum-globulin, A., ii, 211.
- Gueroult, Georges**, estimation of lead in cupriferous minerals with calciferous gangue, A., ii, 130.
- Guerrieri, Floriano**, pressed grapes, compared with hay and straw, for cattle food, A., ii, 683.
- Güsewell, Paul.** See *August Michaelis*.
- Guffroy, Ch.**, influence of variety [of potatoes] and manures on the quality of the starch, A., ii, 684.
- Guggenheim, Bernhard.** See *Friedrich Kehrman*.
- Guichard, Marcel**, action of steam and of mixtures of steam and hydrogen on molybdenum and its oxides, A., ii, 62.
- action of water on molybdenum pentachloride, A., ii, 243.
- oxides, sulphides, and iodides of molybdenum, A., ii, 659.
- Guichard, Marcel.** See also *Edouard Defacqz*.
- Guillemand, H.**, use of silicotungstic acid as a reagent for the alkaloids in urine; variations in alkaloidal nitrogen, A., ii, 521.
- Guillemonat, A.** See *Albert Charrin*.
- Guillet, Léon**, aluminium alloys; combination of aluminium and tungsten, A., ii, 388.
- aluminium alloys; compounds of aluminium and molybdenum, A., ii, 512, 602.
- Guinchant, Joseph**, compressibility of solutions, A., ii, 227.
- Gulewitsch, Wladimir von**, urea formation in the body. I. Introduction, A., ii, 29.
- Gulewitsch, Wladimir von**, and *A. Jochelsohn*, urea formation in the body. II. The occurrence of arginine in the spleen, A., ii, 29.
- Gully, Eugen**, estimation of phosphoric acid in soils by centrifugalising the ammonium phosphomolybdate, A., ii, 576.
- Gunkel, E.** See *August Michaelis*.
- Guntz, Antoine**, barium hydride, A., ii, 385.
- Gustavson, Gabriel**, action of bromine on trimethylene under different conditions, A., i, 3.
- action of bromine on 1:1-dimethyltrimethylene, A., i, 61.
- preparation of aluminium chloride, bromide, and iodide, A., ii, 316.
- Gutbier, Alexander**, thio-1-methylpyridone and thio-1-methylquinolone, A., i, 96.
- reduction of phenylthiocarbimide, A., i, 528.
- tellurium, A., ii, 501.
- gravimetric estimation of tellurium, A., ii, 687.
- Guthrie, A.**, solubility of lime in water at different temperatures, A., ii, 315.
- Guthrie, Tom.** See *Rudolph Fittig*.
- Guthzeit, Max**, [and *A. Weiss*], binolecular ethyl dicarboxyglutaconate, A., i, 314.
- Guye, Philippe A.**, optical activity of certain ethers and esters, T., 475; P., 1901, 48.
- active amyl derivatives, A., i, 442.
- Guye, Philippe A.**, and *Achille Baud*, polymerisation of organic liquids, A., ii, 437.
- capillary constants of organic liquids, A., ii, 543.
- Guye, Philippe A.**, and *F. Louis Perrot*, employment of the method of counting drops for the measurement of surface tensions, A., ii, 374.

Guyot, *Alfred*. See *Albin Haller*.

Gwiggner, *A.*, apparatus for the evolution of dry hydrogen chloride, *A.*, ii, 93.

H.

Haarmann & Reimer, isolation of iso-iron from bearswort oil, *A.*, i, 727.

Haarst, *P. M. van*. See *Willem Arne van Dorp*.

Haase, *E.* See *Ludwig Claisen*.

Haber, *Fritz*, autoxidation: supplementary note, *A.*, ii, 93.

— autoxidation and its connection with the theories of ions and of the galvanic cell, *A.*, ii, 299.

— ferrite solutions, *A.*, ii, 555.

— [electrochemical reduction], *A.*, ii, 638.

Haber, *Fritz*, [and, in part, *Waldemar Pick*], soluble alkali salts of ferric oxide and of ferric acid, *A.*, ii, 103.

Habermann, *Josef*, cigar smoke, *A.*, ii, 680.

Habermann, *Josef*, and *R. Ehrenfeld*, proteids, *A.*, i, 57.

— action of nascent chlorine on casein, *A.*, i, 622.

Hackhofer, *Theodor*, [condensation of] benzaldehyde with propaldehyde, *A.*, i, 277.

Haeussermann, *Carl*, tertiary aromatic amines, IV., *A.*, i, 229.

Haeussermann, *Carl*, and *Aug. Müller*, some derivatives of phenyl ether, *A.*, i, 382.

Haeussermann, *Carl*, and *Alb. Sigel*, perchloric acid, *A.*, ii, 124.

Haeussermann, *J.* See *Edgar Wedekind*.

Haga, *Tamemasa*. See *Edward Divers*.

Hagenbach, *August*, change of conductivity with temperature up to and above the critical temperature in solutions of salts in liquid sulphur dioxide; electrolytic conduction in gases and vapours; absorption spectra of solutions of iodides, *A.*, ii, 434.

Hahn, *Martin*, chemical processes in the juice of *Arum maculatum*, *A.*, ii, 121.

Hahn, *Martin*, and *Ludwig Geret*, endo-trypsin, an enzyme from yeast, *A.*, i, 59.

— [proteolytic enzyme from yeast]. A reply to Kutscher, *A.*, ii, 677.

Halász, *Z.*, the Blondlot-Dusart method in chemico-legal cases, *A.*, ii, 343.

Haldane, *John Scott*, the red colour of salted meat, *A.*, ii, 462.

— a rapid method of estimating carbon dioxide in air, *A.*, ii, 477.

Haldane, *John Scott*, colorimetric determination of hæmoglobin, *A.*, ii, 488.

Hale, *William J.* See *Isaac K. Phelps*.

Hall, *A. D.*, uniformity in soil analyses, *A.*, ii, 80.

Hall, *Harold*. See *Frederic Stanley Kipping*.

Hall, *Roy D.* See *Louis Kahlenberg*.

Halla, *Ad.* See *Franz W. Dafert*.

Haller, *Albin*, new synthesis effected by the aid of compounds containing the methylene group attached to one or two acid radicles: action of epichlorohydrin and epibromohydrin on the sodium derivatives of benzoylacetic esters, *A.*, i, 538.

Haller, *Albin*, and *Georges Blanc*, alkylcyanomalonate esters and their corresponding alkylcyanoacetic acids, *A.*, i, 260.

Haller, *Albin*, and *Alfred Guyot*, tautomerism of *o*-benzoylbenzoic acid, *A.*, i, 146.

— dialkylamino-*o*-benzoylbenzoic acids and their derivatives, *A.*, i, 276.

— dialkylaminobenzoylbenzoic acids derived from the benzoyl acids, II., *A.*, i, 276.

— preparation and properties of dialkylaminanthraquinones, III., *A.*, i, 279.

— new derivatives of dimethylaminobenzoylbenzoic acid, *A.*, i, 324.

— tetramethyldiaminophenylanthranol and tetramethyldiaminophenylloxanthranol, *A.*, i, 350.

— synthesis of a phenyldiphenylenemethane colouring matter, *A.*, i, 569.

Haller, *Albin*, and *Jules Minguin*, new derivatives of benzylcamphor and benzylidenecamphor, *A.*, i, 599.

Haller, *Albin*, and *Herm. Umbgrove*, dimethyl- and diethyl-aminobenzoyltetrachlorobenzoic acids and their derivatives, *A.*, i, 469.

— derivatives of dialkylaminobenzoyltetrachlorobenzoic and dialkylamino-*m*-hydroxybenzoyltetrachlorobenzoic acids; corresponding dialkylaminanthraquinones and dialkylaminohydroxyanthraquinones, *A.*, i, 644.

Halliburton, *William Dobinson*, physiological action of extracts of nervous tissues, *A.*, ii, 181.

Halliburton, *William Dobinson*, and *Frederick W. Mott*, chemistry of nerve degeneration, *A.*, ii, 260.

Halliburton, *William Dobinson*. See also *Frederick W. Mott*.

- Halpern, Jakob H.**, acetaldol [aldol], A., i, 255.
- Halphen, Georges**, use of amyl alcohol in the analysis of fats, A., ii, 359.
- Hamberger, Paul**, a simple fermentation saccharimeter, A., ii, 354.
- Hamburger, Hartog Jakob**, permeability of the red blood corpuscles for NO_3 and SO_4 ions, A., ii, 175.
- Hamilton, Lewis P.**, and **Edgar Francis Smith**, alloys made in the electric furnace, A., ii, 385.
- Hammarsten, Olof**, bile of polar animals. 1. Bile of the polar bear, A., ii, 520.
- Hamonet, Jules**, electrolysis of hydroxy-acids: preparation of β -amylxypropionic acid and the diamyl derivative of butylene glycol, A., i, 187.
- $\alpha\delta$ -dibromobutane and $\alpha\delta$ -diiodobutane; new synthesis of adipic acid, A., i, 247.
- new diprimary glycol; $\alpha\delta$ -butanediol or tetramethylene glycol and its diacetin, A., i, 251.
- action of zinc on tetramethylene dibromide and diiodide, A., i, 305.
- Hanemann, Joseph**, Lysimeter experiments in 1899, A., ii, 276.
- vegetation experiments in 1899, A., ii, 528.
- Hanke, Erwin**. See **Hans von Pechmann**.
- Hanriot, Maurice**, mechanism of the action of enzymes, A., i, 243.
- mechanism of the actions of diastases, A., ii, 175.
- mechanism of lipolytic reactions, A., ii, 324.
- lipase, A., ii, 562.
- Hansen, C.** See **Valdemar Henriques**.
- Hantzsch, Arthur [Rudolf]**, the formula of cotarnine, A., i, 162.
- influence of non-electrolytes on the conductivity of electrolytes, A., ii, 54.
- Hantzsch, Arthur**, and **Martin Lehmann**, bisazoxyacetic acid, bisazoxymethane, and hydraziaacetic acid, A., i, 132.
- derivatives of isodiazomethane, A., i, 678.
- Hantzsch, Arthur**, and **Otto Schwab**, condensation products of aldehydes and amines, A., i, 378.
- Hantzsch, Arthur**, and **A. Vagt**, so-called diazoguanidine, A., i, 194.
- Hantzsch, Arthur**, and **E. Voegelen**, [with **Max Buchner**], the so-called iso-amides and true amides, A., i, 676.
- Hantzsch, Arthur**, and **Rudolf Witz**, anils of thiophenylaldehyde, A., i, 401.
- Hanuš, Jos.**, estimation of vanillin in the presence of piperonaldehyde, A., ii, 206.
- Harden, Arthur**, the chemical action of *Bacillus coli communis* and similar organisms on carbohydrates and allied compounds, T., 610; P., 1901, 57; discussion, P., 58.
- fermentation of sugars by *Bacillus coli communis* and allied organisms, I., A., ii, 410.
- fermentation of glucose by *Bacterium icteroides*, A., ii, 567.
- Harden, Arthur**, and **J. Okell**, note on the action of nitrous acid on β -nitroso- α -naphthylamine, P., 1900, 229.
- Harden, Arthur**, and **Sydney Rowland**, autofermentation and liquefaction of pressed yeast, T., 1227; P., 1901, 189.
- Harding, Everhart P.**, and **Lillian Cohen**, preparation of 2:5-dimethylbenzaldehyde; the establishment of its constitution and preparation of some of its derivatives, A., i, 725.
- Hardy, P.**, composition of cows' milk in different stages of milking, A., ii, 672.
- Hare, Hobart A.**, action of strychnine on the spinal cord of rabbits, A., ii, 522.
- Harker, Alfred**, average composition of British igneous rocks, A., ii, 114.
- Harker, George**, labradorite and topaz from N. S. Wales: estimation of fluorine, A., ii, 320.
- Harlay, V.**, reserve carbohydrate in the root swellings of *Arrhenatherum bulbosum*, A., ii, 267.
- Harries, Carl D.**, formaldehyde, A., i, 254.
- succindialdehyde, A., i, 451.
- auto-oxidation of carvone, A., i, 551.
- conversion of pyrrole into the tetramethylacetal of succindialdehyde, A., i, 633.
- behaviour of caoutchouc towards nitrous acid, A., i, 733.
- Harries, [Carl D.]**, [with **Suren Adamiantz**, and **Ernest Atkinson**], preparation of doubly unsaturated hydrocarbons, A., i, 194.
- Harries, Carl D.**, and **Pappos**, a trimethyltriase, A., i, 673.
- Harries, Carl D.**, and **Otto Schanwecker**, semialdehyde of β -methyladipic acid, A., i, 448.
- constitution of citronellaldehyde, A., i, 730.
- Harries, Carl D.**, [and **Carl Stirn**], Δ^6 -menthene-2-one and carvotanacetone, A., i, 551.
- Harries, Carl D.**, and **Maurus Weiss**, a method of preparing hydantoin, A., i, 71.

- Hart, *Edwin*, decomposition products of proteids, A., i, 783.
- Harting, *H.* See *J. Domke*.
- Hartleb, *C.*, estimation of sulphuric acid in drinking waters, A., ii, 627.
- Hartley, *Walter Noel*, action of heat on the absorption spectra and chemical constitution of saline solutions, A., ii, 53.
- spark spectrum of silicon as rendered by silicates, A., ii, 367.
- Hartley, *Walter Noel*, *James Johnstone Dobbie*, and *Alexander Lauder*, the absorption spectra of cyanogen compounds, T., 848; P., 1901, 125.
- Hartley, *Walter Noel*, and *Hugh Ramage*, a simplified method for the spectrographic analysis of minerals, T., 61; P., 1900, 191.
- spectra of flames resulting from operations in the open-hearth and basic Bessemer processes, A., ii, 366.
- mineral constituents of dust and soot from various sources, A., ii, 399.
- Hartman, *Robert Nelson*. See *Arthur Michael*.
- Hartmann, *R.*, volumetric estimation of chromium oxide in chromium oxide mordants, A., ii, 626.
- Hartog, *Philip Joseph*. See *Gilbert John Fowler*.
- Hartogh, and *O. Schumm*, sugar formation from fat, A., ii, 176.
- Hartwell, *Burt L.* See *Homer J. Wheeler*.
- Hartwich, *C.*, and *M. Gamper*, angostura barks, A., ii, 70.
- Harvey, *Alfred William*. See *William Jackson Pope*.
- Haslam, *H. C.*, hexon bases in heteroalbumose and in peptone (deuteroalbumose), A., i, 492.
- Hasselberg, *Clas Bernhard*, cosmic diffusion of vanadium, A., ii, 251.
- Hatfield, *H. S.* See *William Ramsay*.
- Hauke, *Rudolph*, "*Radix Naregamie*," A., ii, 70.
- Hauser, *M.* See *Josef Herzig*.
- Hauser, *Max*. See *Hans von Pechmann*.
- Hauser, *Otto*. See *Ludwig Vanino*.
- Hausser, *Jean [Louis]*. See *Cathelineau*.
- Hawk, *P. B.*, and *William J. Gies*, gluco-proteid of bone, A., i, 298.
- ossco-mucoid, A., ii, 520.
- Hayashi, *H.*, chemical nature of the tetanus poison, and the chemistry of albumoses, A., i, 354.
- Haywood, *John K.*, composition and analysis of London purple, A., ii, 126.
- Hazard, *J.*, [analysis of] soils, A., ii, 282.
- Heathcote, *Henry L.*, rendering passive, passivity, and rendering active of iron, A., ii, 445.
- Hébert, *Alexandre*, action of zinc powder on saturated fatty acids, A., i, 251.
- saps, III., A., ii, 34.
- Hébert, *Alexandre*, and *Georges Reynaud*, specific absorption of X-rays by metallic salts, A., ii, 215.
- Hébert, *Alexandre*. See also *Eugène Charabot*.
- Heckel, *Edouard*, presence of copper in plants and the amount they may contain, A., ii, 331.
- Hedin, *Sven Gustav*, and *Sydney Rowland*, a proteolytic enzyme in the spleen, A., ii, 402.
- proteolytic enzymes in the organs and tissues of the body, A., ii, 462.
- Hédou, *E.*, hæmolytic produced by solanine, A., ii, 325.
- the affinity of red blood corpuscles, for acids and alkalis and the resistance so produced towards solanine, A., ii, 611.
- Hefelmann, *Rudolf*, improving the delicacy of the diphenylamine test for nitric acid, A., ii, 532.
- estimation of soluble lead in resinate-driers, A., ii, 532.
- the amount of pentosans in gum arabic, A., ii, 535.
- Heffter, *K. W. Arthur*, cactus alkaloids, IV., A., i, 736.
- behaviour of cacodylic acid in the organism and its detection in urine, A., ii, 464.
- Hegeler, *A.*, influence of chemical reaction on the bactericidal action of serum, A., ii, 567.
- Heide, *C. von der*. See *Eduard Buchner*.
- Heidenreich, *Ole N.*, estimation of copper in pyrites, A., ii, 197.
- Heidepriem, *W.* See *Karl A. Hofmann*.
- Heidrich, *Martin*, 1-methyl-2-vinylpiperidine, A., i, 561.
- Heimann, *M.* See *W. Feuerstein*.
- Heine, *M.* See *August Michaelis*.
- Heinemann, *H. Newton*, influence of foods on muscular work, A., ii, 254.
- Heinrichs, *Carl*. See *Max Busch*.
- Heinze, *Max*. See *Richard Möhlau*.
- Heizmann, *G.* See *Friedrich Krafft*.
- Helbronner, *André*, combination of camphor with β -hydroxy- α -naphthaldehyde, A., i, 600.
- Helmer, *L. Leslie*. See *William Albert Noyes*.
- Hemmelmayer, *Franz von*, ononin, A., i, 160.
- Hempel, *Hans*. See *Adolf Beythien*.

- Hempel, Walther**, carbon oxysulphide, A., ii, 651.
 — [analysis of mixtures of carbon oxysulphide, hydrogen sulphide, and carbon dioxide], A., ii, 691.
- Hemsalech, G. A.**, band spectrum of nitrogen in oscillatory spark, A., ii, 433.
- Henderson, George Gerald**, and **Robert Henry Corstorphine**, condensation of benzil with dibenzyl ketone, T., 1256; P., 1901, 190.
- Henderson, George Gerald**. See also **George Thomas Beilby**.
- Henderson, William E.**, symmetrical chloride of *p*-nitro-*o*-sulphobenzoic acid, A., i, 208.
- Henke, A.** See **Karl Seubert**.
- Henle, Karl**. See **Hugo von Soden**.
- Henning, Anders**, apophyllite from Sultelma, A., ii, 112.
- Henning, G. F.**, new calcium chloride apparatus, A., ii, 420.
- Hennings, R.** See **Wilhelm Autenrieth**.
- Henri, Victor**, action of invert sugar on the inversion of sucrose by sucrase, A., i, 438.
- Henri, Victor**, and **Larguier des Banceles**, simultaneous action of hydrochloric acid on sucrose and methyl acetate, A., ii, 647.
- Henrich, Ferdinand**, constitution of mononitroso-orceinol, A., i, 464.
- Henriet, H.**, estimation of nitrates in water by means of stannous chloride, A., ii, 422.
- Henriques, Valdemar**, and **C. Hansen**, composition of fatty substances in the animal organism, A., ii, 405.
- Henry, Louis**, amino-alcohols, A., i, 16, 68.
 — alternation of volatility in the series of normal primary diamines, A., i, 128.
 — ethylene derivatives, A., i, 577.
 — action of acid chlorides on methanal [paraformaldehyde], A., i, 581.
- Henry, Louis**, [and **Paul Dalle**], derivatives of ethylene ethyl alcohol and ethylene acetic acid, A., i, 582.
- Henry, Thomas Anderson**, the constituents of the sandarac resins, T., 1144; P., 1901, 187.
- Henry, Thomas Anderson**. See also **Wyndham Rowland Dunstan**.
- Hensay**, salivary digestion of carbohydrates in the stomach, A., ii, 666.
- Hensgen, C.**, dissociation of electrolytes; chemical dissociation of copper sulphate under the influence of water and temperature, A., ii, 540.
- Henze, Martin**, hæmocyanin, A., i, 783.
- Henze, Martin**, presence of free aspartic acid in the animal organism, A., ii, 178.
- Henze, Martin**. See also **Johannes Wislicenus**.
- Herzold, Otto**. See **Uhl**, and **H. Weigmann**.
- Herzold, Ottomar**, new test for gelatin and isinglass, A., ii, 52.
- Herbst, Carl**. See **Augustin Bistrzycki**.
- Hérissey, Henri**, influence of sodium fluoride on the action of seminae on the carbohydrates in the horny albumens of the seeds of Leguminosæ, A., ii, 570.
- Hérissey, Henri**. See also **Émile Bourquelot**.
- Herold, Willy**. See **Ludwig Wolff**.
- Herting, Otto**, a peculiar double cyanide, A., i, 516.
 — analysis of tungsten- and chrome-steel; estimation of tungstic acid and its separation from silicic acid, A., ii, 284.
 — analysis of commercial cyanides; estimation of cyanic acids; a peculiar double cyanide; antidote for cyanides, A., ii, 534.
- Herty, Ch.** See **Alfred Werner**.
- Hertz, A. F.** See **R. Jamison**.
- Herz, W.**, action of substituted ammonia bases on zinc salts, and a new method for the estimation of zinc, A., ii, 240.
 — estimation of zinc, A., ii, 281.
 — estimation of metals by organic bases, A., ii, 478.
 — cobalt sulphide, A., ii, 513.
- Herz, W.**, and **K. Drucker**, estimation of magnesium by organic bases, A., ii, 348.
- Herz, W.** See also **Richard Abegg**.
- Herzen, Alex.**, influence of certain materials on the quantity and quality of gastric juice, A., ii, 323.
 — the rôle of the spleen in trypsin formation, A., ii, 324.
- Herzfeld, Alexander**, Scheibler's extraction method for the determination of the polarisation of beets, A., ii, 426.
 — acids soluble in ether contained in molasses residues, A., ii, 681.
- Herzfeld, Alexander**, [and **Carl Stiepel**], atomic weight of calcium, A., ii, 239.
- Herzig, Josef**, and **M. Hauser**, alkyl ethers of the phloroglucinols. III. Ethers of dimethylphloroglucinol, A., i, 206.
- Herzig, Josef**, and **H. Kaserer**, alkyl ethers of the phloroglucinols. IV. Trimethyl ether of phloroglucinol, A., i, 206.
- Herzig, Josef**, and **Jacques Pollak**, brazilin and hæmatoxylin. Part VI. Brazilin, A., i, 478.

- Herzig, Josef, and Franz Theuer**, alkyl ethers of phloroglucinols. II. Ethers of methylphloroglucinol, A., i, 205.
- Herzig, Josef, and P. Wengraf**, carbinol compounds of triphenylmethane and its derivatives, A., i, 702.
- Herzig, Josef, and Franz Wenzel**, [and, in part, *Paul Altmann*], esters of phloroglucinolcarboxylic acids, A., i, 473.
- Herzog, Johannes**. See *Wilhelm Manchot*.
- Herzog, R. O., and O. Kruh**, condensation of isobutaldehyde with aromatic ortho-aldehydes, A., i, 213.
- Herzog, R. O., and R. Leiser**, action of iodine on the silver salts of hydroxy-acids, A., i, 499.
- Heslop, Oliver**. See *James Terence Conroy*.
- Hess, H.** See *August Michaelis*.
- Hesse, Albert**, essential oil of jasmine blossom, A., i, 220, 732.
- Hesse, Albert, and Otto Zeitschel**, essential oil of orange blossoms, I., A., i, 733.
- estimation of methyl anthranilate in essential oils, A., ii, 209.
- Hesse, August**. See *Theodor Curtius*.
- Hesse, Oswald**, lichens and their characteristic constituents, A., i, 85, 149, 595.
- lobaric and usnetic acids, A., i, 645.
- acetyltropic acid, A., i, 713.
- alkaloids of mandragora roots, A., i, 740.
- Hester, C.**, decomposition and formation of fat in the tissues, A., ii, 461.
- Heteren, W. J. van**, aromatic nitro-compounds. XIV. Action of potassium cyanide on 1-chloro-2:4-dinitrobenzene in alcoholic solution, A., i, 460.
- Heun, Georg**. See *Hans Stobbe*.
- Hewitt, John Theodore, and John Jacob Fox**, the nitration of benzeneazosalicylic acid, T., 49; P., 1900, 189.
- Hewitt, John Theodore, and James Henry Lindfield**, the nitration of the three tolueneazophenols, T., 155; P., 1900, 222; discussion, P., 222.
- Hewitt, John Theodore, and Henry Ablett Phillips**, the bromination of *o*-oxyazo-compounds and its bearing on their constitution, T., 160; P., 1900, 223.
- Hewitt, John Theodore, and John N. Tervet**, action of bromine on the three tolueneazophenols, T., 1090; P., 1901, 172.
- Hewitt, John Theodore, and Alfred John Turner**, action of β -naphthol on aldehydes, A., i, 207.
- Hewlett, Albion Walter**. See *Joseph Erlanger*.
- Hewlett, Richard T.**, indole-like reaction given by cultures of the diphtheria and pseudo-diphtheria bacilli, A., ii, 567.
- Heycock, Charles Thomas, and Francis Henry Neville**, results of chilling copper-tin alloys, A., ii, 508.
- Heyden, von**. See *Chemische Fabrik von Heyden*.
- Heyl, Georg**, tannin contained in *Sequoia gigantea*, A., i, 648.
- occurrence of alkaloids and saponins in Cactaceæ, A., i, 738.
- Heynsius, D.** See *Paul Duden*.
- Hiby, Walther**. See *Friedrich Kehrmann*.
- Hicks, G. H.**, germination of seeds as affected by certain chemical manures, A., ii, 330.
- Higgins, C. Longuet**, the preparation of an exact standard acid, A., ii, 190.
- Hilbert, H.** See *Adolph Emmerling*.
- Hildebrandt, A.** See *Franz Kunczell*.
- Hildebrandt, Hermann**, synthesis in the animal organism. II. Compounds of the camphor group, A., ii, 180.
- relationships between physiological action, chemical constitution, and chemical change in the organism, A., ii, 614.
- syntheses in the animal organism. III. Oxidation products of citral in the organisms and some cyclic isomerides, A., ii, 669.
- Hildesheimer, Arnold**, condensation of isobutaldehyde with *p*-hydroxy- and *p*-ethoxy-benzaldehydes, A., i, 645.
- Hilger, Albert**, estimation of malic acid, A., ii, 290.
- Hill, Arthur Croft**, a method of isolating maltose when mixed with glucose, P., 1901, 45.
- taka-diastase and reversed ferment action, P., 1901, 184.
- synthetic action of yeast maltase, A., i, 452.
- Hill, Henry Barker**, dehydromucic acid, A., i, 555.
- Hill, Henry Barker, and Alvin S. Wheeler**, reduction of dehydromucic acid, A., i, 556.
- Hillebrand, William Francis**, some principles and methods of rock analysis, A., ii, 75.
- Hillebrand, William Francis, and Henry N. Stokes**, influence of pyrites and other sulphides on the estimation of bivalent iron, A., ii, 424.
- Hillinghaus, F.** See *August Michaelis*.
- Hillyer, Homer Winthrop**. See *A. N. Cook*.

- Hiltner, Lorenz**, assimilation of free atmospheric nitrogen by Mycelia in the above-ground portions of plants, A., ii, 32.
- Hiltner, Lorenz**. See also *Friedrich Nobbe*.
- Hiltner, R. S.**, and *R. W. Thatcher*, rapid estimation of sugar in beets, A., ii, 535.
- Hinrichsen, Willy**. See *Jacobus Henricus van't Hoff*.
- Hinsberg, Oscar**, diagnosis of primary and secondary amines, A., i, 128.
- Hird, Jas. Morton**. See *Frank Geo. Pope*.
- Hirsch, Robert**, nitrosulphosalicylic acids, A., i, 84.
- Hirsch, Sylvain**. See *Fritz Fichter*.
- Hirschel, Wilhelm**, distillation in a vacuum with Hempel's dephlegmator, A., ii, 87.
- Hirschfeld, S.** See *Carl Adam Bischoff*.
- His, Wilhelm, jun.**, and *Theodor Paul*, physico-chemical researches on the behaviour of uric acid and its salts in solution, A., i, 131.
- Hlavnička, Ottokar Josef**, allocinehonine, A., i, 404.
- Höber, Rudolf**, platinum catalysis: observations on gas cells, A., ii, 151.
- absorption in the intestine, A., ii, 610.
- Hödlmoser, Carl**, arsenic in the organs of the body, A., ii, 673.
- Hönigschmid, Otto**, tetrahydrodiphenylene oxide, A., i, 700.
- Höpfner, Wilhelm**. See *Carl Bülow*.
- Hofbauer, Ludwig**, the absorption of artificially coloured fats, A., ii, 403.
- Hoff, Jacobus Henricus van't**, crystallisation of complex salt solutions with particular reference to oceanic salt deposits, A., ii, 558.
- Hoff, Jacobus Henricus van't**, and *H. von Euler-Chelpin*, formation of oceanic salt deposits, particularly of the Stassfurt beds. XIX. Maximum vapour pressure at 25° of solutions of the chlorides and sulphates of magnesium and potassium, the solutions being saturated with sodium chloride: the formation of kainite at 25°, A., ii, 249.
- Hoff, Jacobus Henricus van't, Willy Hinrichsen**, and *Fritz Weigert*, formation of oceanic salt deposits, particularly of the Stassfurt beds. XXII. Gypsum and anhydrite. II. The soluble anhydrite (CaSO_4), A., ii, 506.
- Hoff, Jacobus Henricus van't**, and *Wilhelm Meyerhoffer*, formation of oceanic salt deposits, particularly of the Stassfurt beds. XXI. Formation of kainite at 25°, A., ii, 396.
- Hoff, Jacobus Henricus van't**, and *Harold A. Wilson*, formation of oceanic salt deposits, particularly of the Stassfurt beds. XX. Formation of syngenite at 25°, A., ii, 249.
- Hoffmann, G. Christian**, new mineral occurrences in Canada, A., ii, 250, 319.
- Hoffmann, H.** See *Kurt von Rümker*.
- Hoffmann, J.**, some derivatives of dibromothymoquinone, A., i, 473.
- Hoffmann, Paul**, examination of the bog earth of Bad-Sülze, and *Göldenitz*, with a comparative table of certain bog earths, A., ii, 188.
- estimation of iron in normal and pathological human urine, A., ii, 326.
- iron in the hen's egg, A., ii, 608.
- Hoffmeister, Wilhelm**, estimation of cellulose, &c., in plants, &c., A., ii, 205.
- Hofman-Bang, N. O.** See *Robert Chodat*.
- Hofmann, Karl A.**, and *W. Heidepriem*, analysis of a bröggerite, A., ii, 396.
- Hofmann, Karl A., A. Korn**, and *Eduard Strauss*, action of cathode rays on radio-active substances, A., ii, 216.
- Hofmann, Karl A.**, and *Wilhelm Prandtl*, zirconium earth in euxenite from Brevig, A., ii, 387.
- Hofmann, Karl A.**, and *Eduard Strauss*, radio-active lead and radio-active rare earths, A., ii, 19.
- — radio-active lead, A., ii, 159, 385, 655.
- Hofmann, Karl A.** See also *Wilhelm Prandtl*.
- Hohenemser, W.**, and *Richard Wolfenstein*, stereochemistry of the piperidine series, II, A., i, 606.
- Holborn, Ludwig**, and *Arthur Day*, air thermometer at high temperatures, A., ii, 84.
- — melting point of gold, A., ii, 85.
- Holde, D.**, and *J. Marcusson*, quantitative reactions to distinguish between petroleum or cannel coal pitches and pitches from distillation of fats, A., ii, 76.
- Holde, D.**, and *M. Stange*, mixed glycerides in natural fats, A., i, 577.
- Hollander, Charles**. See *Richard Willstätter*.
- Holland, Auguste**, analysis of commercial copper, A., ii, 478.
- estimation of silver in ores containing sulphur, A., ii, 578.

- Holleman, *Arnold Frederik*, isonitroso-compounds, A., i, 3.
 — nitration of *o*-chloro- and *o*-bromobenzoic acids, A., i, 275.
 — simultaneous formation of isomeric substitution derivatives of benzene, A., i, 318.
 — structure of Kalle and Co.'s *o*-chlorodinitrobenzoic acid, A., i, 591.
 Holleman, *Arnold Frederik*, and *B. R. de Bruyn*, nitration of *o*- and *m*-chloro- and -bromo-benzoic acids, A., i, 591.
 Hollmann, *Reinhard*, vapour pressure of mixed crystals of isomorphous salts, A., ii, 436.
 Holm, *E.*, *A. V. Krarup*, and *P. V. F. Petersen*, refractive power, amount of volatile fatty acids, and the iodine number of butter fat, A., ii, 291.
 Holmes, *John*. See *Thomas Edward Thorpe*.
 Holmes, *Willis B.*, action of the chlorides of *o*-sulphobenzoic and of *p*-nitro-*o*-sulphobenzoic acids on carbamide, A., i, 271.
 Holroyd, *George W. F.*, the electrolytic reduction of nitrourea, T., 1326; P., 1901, 197.
 Holsboer, *H. B.*, heats of solution, especially that of $\text{CuSO}_4/3\text{H}_2\text{O}$, A., ii, 226.
 Holzmann, *Herm.* See *Max Busch*.
 Hopkins, *Arthur John*, crystallisation of copper sulphate, A., ii, 452.
 Hopkins, *F. Gouland*, and *Sidney W. Cole*, Adamkiewicz's proteid reaction, chemistry of glyoxylic acid, A., i, 310.
 Horn, *D. W.* See *Harmon Northrup Morse*.
 Hoskins, *A. Percy*. See *James Lorrain Smith*.
 Hosseus, *C.* See *August Michaelis*.
 Hotter, *Eduard*, estimation of calcium oxide in soils, A., ii, 623.
 Hubaleck, *M.* See *Carl Paal*.
 Huber, *Hermann von*, titration of the alkalinity of solutions containing hypochlorites, chlorates and chromates, A., ii, 276.
 Hünckel d'Herculais, *J.*, locusts as manure, A., ii, 342.
 Hünneke, *B.* See *Josef König*.
 Hüttner, *Erwin*, oxides of cobalt, A., ii, 389.
 Hugershoff, *A.*, action of halogens on thiocarbamides, A., i, 757.
 Hugershoff, *A.*, and *W. Chr. König*, reaction of the isomeric acetylthiocarbamides with aqueous sodium hydroxide, A., i, 27.
 — some isomeric acetylthiocarbamides of the naphthalene series, A., i, 27.
 Hugershoff, *A.*, and *W. Chr. König*, action of bromine on acetyldiphenylthiocarbamide in chloroform solution, A., i, 758.
 Hughes, *John*, basic superphosphate, its preparation and use as a manure, A., ii, 471.
 Hugot, *Charles*, action of sodammonium and potassammonium on certain metalloids, A., ii, 18.
 Hugounenq, *Louis*, oxidising action of ammonium persulphate on products of the animal organism, A., i, 242.
 — presence of guanine in commercial uric acid, A., i, 262.
 — formation of urea by the oxidation of albumin by means of ammonium persulphate, A., i, 491.
 — mineral composition of the human foetus and new-born child, A., ii, 405.
 Huiskamp, *W.*, proteids of the thymus, A., ii, 461.
 Huiskamp, *W.* See also *Cornelis A. Pekelharing*.
 Huizenga, *H. E.* See *H. Wibbens*.
 Huldshinsky, *Ernst*. See *Arthur Rosenheim*.
 Hulett, *George Aug.*, connection between surface tension and solubility, A., ii, 493.
 Humphrey, *Ed.* See *Alfred Werner*.
 Hunger, *F. W. T.*, oxydase and peroxydase reactions, A., i, 784.
 Hunkel, *Carl G.*, chemistry of rhubarb, A., ii, 263.
 Hunt, *Reid*, substances which lower blood-pressure in suprarenal extracts, A., ii, 259.
 — intravenous injection of minimal doses of epinephrine sulphate, A., ii, 259.
 Hunter, *Albert E.* See *Frederic Stanley Kipping*.
 Hurtle, *William Holdsworth*, the chlorodibromo- and dichlorobromobenzenes, T., 1293; P., 1901, 191.

I.

- Ibbotson, *Fred*, and *Harry Brearley*, estimation of manganese and chromium in tungsten alloys, A., ii, 198.
 — analysis of ferro-silicons and silico-spiegel, A., ii, 199.
 — estimation of tungsten in steel and steel-making alloys, A., ii, 199.
 — estimation of phosphorus in steel and iron, A., ii, 343.
 Ide, *Manille*, antidotes for chemically pure proteids, A., ii, 464.
 Ikeda, *Kikunaye*. See *Georg Bredig*.
 Ilzhöfer, *Hermann*. See *Otto Dimroth*.

- Imbert, Henri**, action of pyridine bases on tetrahalogenated benzoquinones, A., i, 651.
 — action of pyridine bases on tetrahalogen derivatives of quinone, A., i, 652.
 — acidimetric estimation of protocatechuic acid, A., ii, 45.
- Immendorff, Heinrich**, methods for the valuation of calcareous soil improvers and the estimation of readily soluble alkaline earths and their carbonates in soils, A., ii, 130.
 — free humic acids in mineral soil and their importance in agriculture, A., ii, 620.
- Immerwahr, Cl.**, electrochemical studies of the solubility of precipitates containing heavy metals, A., ii, 301.
- Immerwahr, Cl.** See also **Richard Abegg**.
- Indemans, W. G. A.**, Ceylon oil in margarine and butter, A., ii, 78.
- Innes, William Ross**, note on the use of pyridine for molecular weight determinations by the ebullioscopic method, T., 261: P., 1900, 223.
- Ipatieff, Vladimir**, pyrogenic reactions of organic compounds, A., i, 248.
 — synthesis of methylheptenone, A., i, 256.
 — action of zinc dust on the dibromides $C_nH_{2n}Br_2$, A., i, 305.
- Ipsen, Carl**, value of the hæmatoporphyrin test for the forensic detection of blood, A., ii, 296.
- Irvine, James C.**, preparation of *o*-dimethoxybenzoin, and a new method of preparing salicylaldehyde methyl ether, T., 668; P., 1901, 88.
- Irvine, James C.** See also **Thomas Purdie**.
- Irwin, Wilfrid**, [estimation of sulphur in commercial benzene intended for enriching illuminating gas], A., ii, 473.
- Issaew, W.**, enzymes, A., ii, 262.
- Itzig, Herrmann**, influence of molybdates and tungstates on the specific rotation of tartrates, A., i, 448.
 — influence of molybdic acid and molybdates on the specific rotation of malates, A., i, 580.
- Iwanoff, M.**, production of proteids in plants in absence of light, A., ii, 184.
- Iwanowski, D.**, and **S. Obrastzoff**, influence of oxygen on the fermentation produced by different species of yeast, A., ii, 568.
- J.
- Jablonski, Siegfried**. See **Conrad Willgerodt**.
- Jackson, Charles Loring**, and **G. E. Behr**, symmetrical tri-iodobenzene, A., i, 586.
- Jackson, Charles Loring**, and **Wallace P. Cohoe**, derivatives of *m*-dibromodinitrobenzene, A., i, 585.
- Jackson, Charles Loring**, and **Richard B. Earle**, action of sodium sulphite on tribromodinitrobenzene and tribromotrinitrobenzene, A., i, 585.
- Jackson, Charles Loring**, and **Waldemar Koch**, derivatives of *o*-benzoquinone, A., i, 597.
- Jackson, Henry**, molecular weight of glycogen, A., i, 371.
- Jackson, Henry**. See also **Richard Harrison Solly**.
- Jackson, Holmes C.** See **Leon Asher**.
- Jackson, Percy George**. See **Leonard Archbutt**.
- Jackson, W.**, and **E. M. Rich**, proximate analysis of clays, A., ii, 198.
- Jacob, Paul**, sulphonic derivatives of methyl *p*-amino-*m*-hydroxybenzoate (orthoform), A., i, 31.
- Jacobson, Paul**, and **Adolf Steinbrenek**, condensation products of aldehydes and amines, A., i, 380.
- Jacoby, Martin**, first appearance of aldehydase in the mammalian embryo, A., ii, 670.
 — autolysis of the lung, A., ii, 670.
 — ricin immunity, A., ii, 678.
- Jacoby, Richard**. See **Richard Jos. Meyer**.
- Jacquemin, Georges**, preparation of bottom fermentation yeasts having the property of fermenting at high temperatures, and the method of employing them, A., ii, 567.
- Jaeger, A.**, behaviour of fluorides of the heavy metals in solution, A., ii, 386.
- Jaeger, Karl**. See **Johannes Thiele**.
- Jaeger, Wilhelm**, and **H. Diesselhorst**, thermal and electrical conductivity, thermal capacity, and thermo-electric efficiency of some metals, A., ii, 84.
- Jaeger, Wilhelm**, and **Stephan Lindeck**, researches on standard cells, especially the Weston cadmium cell, A., ii, 368.
- Jaffé, Max**, red colouring matter occurring in urine after administration of pyramidone, A., ii, 672.
- Jahn, Hans**, the Nernst formula for the E.M.F. of concentration elements, A., ii, 299.
 — degree of dissociation and dissociation equilibrium in the case of highly dissociated electrolytes, A., ii, 491, 592.
- Jahn, Hans**, [**Ernst Berliner**, **Petru Bogdan**, **David Bukschnewski**, **Joséph Goldhaber**, **Milau Metelka**, **Sally Oppenheimer**, and **Berthold Redlich**], speed of migration of ions in dilute solutions, A., ii, 540.

- Jahn, *M.*, estimation of fat in fodders, A., ii, 431.
- Jahrmarkt, *Moritz*. See *Johannes Wislicenus*.
- Jakowkin, *Alexander A.*, osmotic pressure of complex solutions, A., ii, 87.
- Jambon, *L.*, some pentachlorophenoxides, A., i, 28.
- Jambon, *L.* See also *Étienne Barral*.
- Jamieson, *G. S.* See *Horace Lemuel Wells*.
- Jamison, *R.*, and *A. F. Hertz*, the 'skin' of warmed milk, A., ii, 672.
- Janda, *F.*, uranyl nitrate, A., ii, 603.
- Japp, *Francis Robert*, and *William B. Davidson*, phenanthroxazine, A., i, 401.
- Japp, *Francis Robert*, and *W. Maitland*, formation of carbazoles: preliminary note, P., 1901, 176.
- Japp, *Francis Robert*, and *Andrew N. Meldrum*, homologues of anhydrazetonebenzil, T., 1024; P., 1901, 174.
- Japp, *Francis Robert*, and *Arthur C. Michie*, reduction of $\alpha\gamma$ -dibenzoylpropane and dibenzoyldiphenylbutadiene, T., 1010; P., 1901, 173.
- Jaross, *K.* See *Max Scholtz*.
- Jaubert, *George F.*, new synthesis of aniline, A., i, 320.
- properties of sodium peroxide, A., ii, 96.
- preparation and properties of hydrates of sodium peroxide, A., ii, 155.
- Jaumann, *Gustav*, theory of solutions, A., ii, 89.
- Javal, *Adolphe*, variations in the excretion of nitrogen and chlorides during insufficient nutrition, A., ii, 565.
- Jean, *Ferdinand*, estimation of tannic acid, organic and mineral acids in tan liquor, A., ii, 294.
- wine analysis; modification of the "sum of alcohol-acid rule," A., ii, 353.
- sunflower oil, A., ii, 483.
- estimation of sulphur in oils, A., ii, 687.
- Jean, *Ferdinand*, and *J. Bruhat*, composition of a so-called blood rain from Sicily, A., ii, 156.
- Jeancard, *Paul*, and *C. Satie*, surface tension and viscosity of some essential oils, A., i, 394.
- — — essence of geranium from Cannes, A., i, 396.
- — — essence of thyme, A., i, 733.
- Jeffrey, *J. A.* See *F. H. King*.
- Jenkins, *Edward H.*, and *A. W. Ogden*, testing food products for boric acid with turmeric paper, A., ii, 346.
- Jenks, *Robert Leonard*. See *Charles Frederick Cross*, and *Robert Francis Wood Smith*.
- Jennings, *Herbert S.*, and *J. H. Crosby*, reaction of bacteria to chemical stimuli, A., ii, 615.
- Jerdan, *David Smiles*. See *William Arthur Bone*.
- Jerwitz, *W.*, new fat extraction apparatus, A., ii, 586.
- Job, *André*, measurement of the velocity of gaseous evolutions; application to the voltameter, A., ii, 83.
- new form of urinometer, A., ii, 139.
- the amperemanometer, A., ii, 222.
- Job, *Robert*, and *Charles T. Davies*, method for the rapid estimation of carbon in steel, A., ii, 127.
- Jochelsohn, *A.* See *Wladimir von Gulewitsch*.
- Jochem, *Emil*, conversion of amino-fatty acids into the corresponding chloroacids, A., i, 129.
- Jørgensen, *Sofus Mads*, constitution of platinum bases, A., i, 163.
- Johannsen, *Wilhelm [Ludwig]*, nitrogen in peas, A., ii, 35.
- Johannsen, *Wilhelm*, and *Fr. Weis*, relation between the weight and the percentage of nitrogen in wheat grain, A., ii, 72.
- John, *Conrad Heinrich von*, phosphates from Moravia, A., ii, 248.
- triplite from Moravia, A., ii, 248.
- chloropal from Moravia, A., ii, 250.
- Johnson & Sons, the assay of gold sodium chloride, A., ii, 350.
- Johnson, *Treat B.* See *Henry Lord Wheeler*.
- Johnson, *W. G.*, some physiological effects of hydrogen cyanide on plants, A., ii, 334.
- Jolles, *Adolf*, oxidation of hippuric acid to carbamide, A., i, 30.
- glycine, A., i, 191.
- asparagine and aspartic acid, A., i, 262.
- proteids, A., i, 190.
- carbamide as the product of oxidation of nitrogenous substances, A., i, 583.
- metabolism of hippuric acid, A., ii, 115.
- oxidation relationships of urine components, A., ii, 259.
- positive indications with the phenylhydrazine test in the absence of sugar, A., ii, 425.
- [estimation of nitrogen] in urine for clinical purposes, A., ii, 688.
- Jolles, *Adolf*, and *Josef K. Friedjung*, iron in human milk, A., ii, 671.

Jolles, Adolf, and **Ferdinand Winkler**, relationship of iron in the urine and in the blood, A., ii, 30.

Jollyman, Walter Henry. See **Walter Charles Cross Pakes**.

Jones, Edward William Taylor, arsenic in beer, A., ii, 280.

Jones, Harry Clary, and **B. Palmer Caldwell**, aqueous solutions of double salts. IV. Iodides, cyanides, nitrates, and sulphates, A., ii, 375.

Jones, Humphrey Owen, substituted ammonium compounds of the type $NR'R''R'''_2X$, A., i, 376.

Jones, Humphrey Owen. See also **Henry John Horstman Fenton**.

Jones, Lewis Ralph, *Barillus carotovorus*, the cause of a white rot of carrots, A., ii, 264.

Jones, Walter, and **John Auer**, oxidation of melaninic acid, A., i, 554.

Jong, A. W. K. de, action of pyruvic acid on its ammonium salt, A., i, 130.

— action of hydrochloric acid on pyruvic acid, A., i, 446.

Jorissen, Armand, a reaction of apiole, A., ii, 205.

— detection of cinnamic acid in presence of benzoic acid, A., ii, 207, 291.

Jouniaux, reduction of silver chloride by hydrogen and the inverse reaction, A., ii, 448.

— action of solar radiations on silver chloride in the presence of hydrogen, A., ii, 506.

— action of silver on hydrogen bromide and the inverse reaction, A., ii, 601.

Jouve, Adolphe, iron silicides, A., ii, 317.

— crystallised calcium oxide, A., ii, 384.

— detection of selenium in sulphuric acid, A., ii, 421.

Jowett, Hooper Albert Dickinson, the constitution of pilocarpine. Parts II. and III., T., 580, 1331; P., 1901, 56, 193.

— a new synthesis of α -ethyltricarballic acid, T., 1346; P., 1901, 199.

Judin, A. See **Alexandr A. Samoiloff**.

Jüptner, Hanns von, iron and steel from the standpoint of the phase rule, A., ii, 161.

Jüttner, Ferencz, calculation of heats of dilution, according to Kirchhoff's formula, A., ii, 592.

— chemical processes in the system: ether—water—hydrogen chloride, A., ii, 595.

Juliusburger, Paul, Dupré-Rankine vapour tension law, A., ii, 86.

Jung, meat extract, A., ii, 258.

Jungfleisch, Emile, and **Eugène Léger**, hydrocinchonine, A., i, 287.

— cinchonine, A., i, 338.

Jurisch, Konrad W., testing of Weldon-deposit, A., ii, 198.

Just, Gerhard, solubility of gases in organic solvents, A., ii, 439.

K.

Kahlenberg, Louis, differences of potential between metals and non-aqueous solutions of their salts, II., A., ii, 81.

— latent heats of evaporation of some organic nitrogenous compounds, A., ii, 492.

Kahlenberg, Louis, [with **Arthur A. Koch**, and **Roy D. Hall**], the theory of electrolytic dissociation as viewed in the light of facts recently ascertained, A., ii, 540.

Kahlenberg, Louis, and **Hugo F. Mehl**, toxic action of electrolytes on fishes, A., ii, 327.

Kahlert, Bruno. See **Richard Stoermer**.

Kalischer, Otto, biology of the peptonising bacteria of milk, A., ii, 119.

Kalle & Co., preparation of 1:5-dinitro- and 1:3:8-trinitro-naphthalenes, A., i, 687.

— primary aminobenzohydrols, A., i, 697.

— thioacridone, A., i, 752.

Kanonnikoff, Innocentius I., true density of chemical compounds and its relation to composition and constitution. II. Oxygenated compounds, A., ii, 305.

— the critical state, A., ii, 438.

Kappeller, G. See **Rudolph F. Weinland**.

Karchowski, D. von. See **August Michaelis**.

Kasatkin, N. See **Herman Decker**.

Kaserer, H. See **Josef Herzig**.

Kassner, Georg, new case of chloroform of crystallisation: leprarinchloroform, A., i, 283.

Kassner, Georg, and **H. Keller**, barium manganate and manganite, A., ii, 657.

Kastle, J. H., and **A. S. Loevenhart**, lipase, the fat-splitting enzyme, and the reversibility of its action, A., i, 178.

Katsuyama, K., influence of certain diuretics on the excretion of alkalis, A., ii, 407.

Katsuyama, K. See also **S. Saito**.

- Kattwinkel, *P.*, and *Richard Wolfenstein*, dibenzylidinitrile [4:4'-dicyano-*s*-diphenylethane], *A.*, i, 594.
- Katzenellenbogen. See *Leopold Spiegel*.
- Kauffmann, *Hugo*, the benzene ring system, *A.*, i, 318.
- Kaufler, *Felix*, influence of the substituting radicle on the tautomerism of phloroglucinol [derivatives], *A.*, i, 206.
- regularities in the melting points of aliphatic diamines, *A.*, i, 259.
- aromatic dicarbylamines, *A.*, i, 462.
- Kaufer, *Felix*, and *Cesar Pomeranz*, aliphatic isocyanides and nitro-compounds, *A.*, i, 634.
- Kaufer, *Felix*, and *Franz Wenzel*, orientating influence of the methoxy-group on the nitro-group, *A.*, i, 590.
- Kaufmann, *A.*, behaviour of an iron cathode in a solution of ammonium nitrate; a new ferrous ferric oxide, *A.*, ii, 554.
- Kaufmann, *Martin*, the cause of the increase of proteid decomposition during inanition, *A.*, ii, 254.
- Kayser, *E.*, intracellular nutrition of yeast, *A.*, ii, 263.
- Kehler, *Lipman F.*, rapid method for the evaluation of chromic acid and soluble chromates, *A.*, ii, 694.
- Kegel, *Ernst*. See *Richard Möhlau*.
- Kehrer, *Eduard Alexandre*, phenacyl-levulinic acid and a new carboxylic acid, $C_{13}H_{13}O_2N$, of the pyrrole group, *A.*, i, 389.
- Kehrmann, *Friedrich*, relation between the constitution of quinols and their tendency to form quinones, *A.*, i, 29.
- relationship between the constitution and colour of isomerides of rosinduline, *A.*, i, 52.
- azoxonium compounds, *A.*, i, 484.
- Kehrmann, *Friedrich*, and *Gregoire Barthe*, syntheses of oxazine and azine derivatives by means of acetylaminonaphthalic acid, *A.*, i, 47.
- Kehrmann, *Friedrich*, and *A. Denk*, 5-acetylamino-1:2-naphthaquinone and the isorosindulines obtained therefrom, *A.*, i, 89.
- Kehrmann, *Friedrich*, and *Josef Eichler*, nitro- and amino-flavindulines, *A.*, i, 421.
- Kehrmann, *Friedrich*, and *Bernhard Guggenheim*, fluorinduline, *A.*, i, 421.
- Kehrmann, *Friedrich*, and *Walther Hiby*, chloro-derivatives of azonium dyes, I., *A.*, i, 418.
- Kehrmann, *Friedrich*, and *Otto Kramer*, preparation and reactions of isophenosafranine, *A.*, i, 52.
- Kehrmann, *Friedrich*, and *S. Krazler*, chloro-derivatives of azonium dyes, III., *A.*, i, 420.
- Kehrmann, *Friedrich*, and *Emile Misslin*, constitution of isorosinduline No. 8. Derivatives of trinitro- α -naphthol [$OH:(NO_2)_3=1:2:4:8$], *A.*, i, 422.
- Kehrmann, *Friedrich*, and *H. Müller*, chloro-derivatives of azonium dyes, II., *A.*, i, 419.
- Kehrmann, *Friedrich*, and *Paul Nüesch*, the fifteenth isomeride of rosinduline, *A.*, i, 767.
- Kehrmann, *Friedrich*, and *Emil Ott*, the fourteenth isomeride of rosinduline, *A.*, i, 767.
- Kehrmann, *Friedrich*, and *M. Silberstein*, the thirteenth isomeride of rosinduline, *A.*, i, 102.
- Kehrmann, *Friedrich*, and *G. Steiner*, the twelfth isomeride of rosinduline, *A.*, i, 100.
- constitution of isorosinduline No. 9, *A.*, i, 101.
- constitution of the naphthapieric acid melting at 145° , *A.*, i, 101.
- two new nitroaminodiphenylamines, *A.*, i, 754.
- Keller, *H.* See *Georg Kassner*.
- Kellner, *Oscar*, and *O. Böttcher*, manurial action of bone phosphoric acid, *A.*, ii, 275.
- Kellner, *Oscar*, *O. Zahn*, and *H. von Gillern*, feeding experiments with molasses and peat meal, *A.*, ii, 469.
- Kelly, *Agnes*, conchite, a new form of calcium carbonate, *A.*, ii, 168.
- Kemp, *James Furman*, recalculation of rock analyses, *A.*, ii, 251.
- Kempf, *Theodor*, preparation of quinone and quinol, *A.*, i, 728.
- Kenrick, *Frank B.* See *William Lash Miller*.
- Keppeler, *Gustav*. See *Paul Eitner*.
- Keppich, *Paul*. See *Eduard Lippmann*.
- Kerschbaum, *Max*. See *Ferdinand Tie-mann*.
- Ketel, *B. A. van*, estimation of the amount of alkaloids in cinchona barks, *A.*, ii, 362.
- Kijanitzin, *J. J.*, the influence of sterilised air on animals, *A.*, ii, 115.
- Kijner, *Nic. M.*, an amine from trimethylencarboxylic acid, *A.*, i, 509.
- King, *F. H.*, and *J. A. Jeffrey*, soluble salts of cultivated soils, *A.*, ii, 338.
- Kippenberger, *Karl*, analytical chemistry of the alkaloids. IV. Action of bromine on strychnine and brucine, *A.*, ii, 52.

- Kippenberger, Karl**, analytical chemistry of the alkaloids. V. Employment of tannic acid for purifying alkaloid residues in chemico-toxicological analysis, A., ii, 79.
- Kipping, Frederic Stanley**, isomeric hydrindamine camphor- π -sulphonates. Racemisation of α -bromocamphor, T., 370; P., 1901, 32.
- experiments on the production of optically active compounds from inactive substances, P., 1900, 226.
- Kipping, Frederic Stanley**, and **G. Clarke**. α -amino- β -methylhydrindene, P., 1901, 181.
- Kipping, Frederic Stanley**, and **Harold Hall**, isomeric salts containing quinquevalent nitrogen. Part VII. Benzylhydrindamine bromocamphorsulphonates, T., 430; P., 1901, 37.
- isomeric hydrindamine mandelates and phenylchloroacetylhydrindamides, T., 442; P., 1901, 36.
- Kipping, Frederic Stanley**, and **Albert E. Hunter**, pheno- α -ketoheptamethylene and its derivatives, T., 602; P., 1901, 68.
- Kipping, Frederic Stanley**, and **Lorenzo Lyndon Lloyd**, organic derivatives of silicon; triphenylsilicol and alkyloxy-silicon chlorides, T., 449; P., 1901, 32.
- Kirchner, W.**, magnesium nitride, A., ii, 450.
- Kirchner, Wilhelm**, and **R. Racine**, the Reichert-Meissl number of Dutch dairy butter, A., ii, 137.
- Kirkby, P. J.** See **John S. Townsend**.
- Kirkwood, J. E.**, and **William J. Gies**, composition of the coccanut during germination, A., ii, 267.
- Kirpal, Alfred**, derivatives of quinolinic and cinchomeronic acids, A., i, 227.
- betaine of quinolinic acid, A., i, 564.
- Kišpatic, M.**, [mineral analyses], A., ii, 321.
- Kissin, W.** See **Carl Adam Bischoff**.
- Kissling, Richard**, occurrence of paraffins in tobacco leaf, A., ii, 680.
- Kistiakowsky, Wladimir A.**, sensitivity to light of hydrogen peroxide in aqueous solution on addition of ferro- and ferri-cyanide, A., ii, 58.
- Kitt, Moriz**, Hübl's iodine solution, A., ii, 587.
- Klapproth, W.** See **Hermann Ost**.
- Klason, Peter**, a new oxide of molybdenum: molybdenum semipentoxide, A., i, 162.
- the molybdic acids, A., ii, 162.
- molybdenum blue, A., ii, 163.
- Klaveness, J.** See **Alexander Tschirch**.
- Klaveren, K. H. L. van**, Arnold's neutral hæmatin, A., i, 782.
- Kleiber, Albert**, estimation of volatile acids and chlorides in wines, A., ii, 629.
- Klein, Arthur**, alteration of free energy during the formation of some slightly soluble metallic salts, A., ii, 225.
- Klein, Carl**, brushite from the island of Mona, West Indies, A., ii, 558.
- Klein, J.**, pig feeding experiments with molasses, peat molasses, and palm-kernel molasses at Proskau, A., ii, 416.
- pig feeding experiments with sugar and palm-kernel seed at Proskau, A., ii, 416.
- Klein, Otto H.**, and **Stephen Farnum Peckham**, cement testing, A., ii, 579.
- Klement, Constantin**, theories of the origin of petroleum, A., ii, 319.
- uraltised diallage from the Ardennes, A., ii, 321.
- Klenze, W. von**, ivy as a calcareous plant, A., ii, 185.
- analysis of butter fat, A., ii, 292.
- Kley, P.**, a [microchemical] test for indium, A., ii, 626.
- Klimont, J.**, composition of cocoa butter; preliminary communication, A., i, 663.
- Kling, André**, oxidation of propylene glycol by *Mycoderma aceti*, A., i, 625.
- Klobb, [Constant] Timothée**, crystalline form of luteocobaltic chlorosulphate and chloroselenate, A., ii, 103.
- Klug, Ferd.**, proteinochrome, A., i, 623.
- Knaps, Peter**, estimation of zinc by means of iodine solution, A., ii, 579.
- Knecht, Wilhelm**, selection of carbohydrates by different yeasts during alcoholic fermentation, A., ii, 568.
- Knez-Milojković, Dobr.** See **Alexander Zega**.
- Knight, Nicholas**, some Iowa dolomites, A., ii, 398.
- Knoll & Co.**, mixed acid anhydrides, A., i, 703.
- anthrapurpurin diacetate, A., i, 730.
- Knorr, Eduard**. See **Wilhelm Koenigs**.
- Knorr, Ludwig**, and **Paul Rabe**, the occurrence of intermediate products in the synthesis of pyrroles from 1:4-diketones, A., i, 163.
- Kobert, Rudolf**, methæmoglobin, A., i, 242.
- interesting abnormal urines, A., ii, 68.
- Koburger, J.** See **Wilhelm Autenrieth**.
- Koch, Arthur A.** See **Louis Kahlenberg**.
- Koch, B.**, influence of the amount of water consumed on the secretion of milk, A., ii, 407.
- Koch, Hugo**, and **Theodor Zerner**, condensation of propaldehyde and formaldehyde, A., i, 633.

- Koch, Wallemar.** See *Charles Loring Jackson*.
- Kochan, Hans.** See *Emil Bose*.
- Kock, A. C. de,** aromatic nitro-compounds. XV. Replacement of the nitro-group by methoxyl in 1-chloro-3:5-dinitrobenzene, A., i, 460.
- Koech, Paul, and Robert Behrend,** transformation of isodialuric acid into dialuric acid, A., i, 262.
- Koechlin, Rudolf,** blödite from Hallstatt, A., ii, 64.
- Köhler, Albert,** composition and heat value of the muscular substance from different animals, A., ii, 255.
- peas, beans, and vetches and their mill products, A., ii, 528.
- Koenig, George August,** mohawkite, stibio-domeykite, domeykite, algo-donite, and some artificial copper arsenides, A., ii, 108.
- König, [Franz] Josef,** estimation of organic carbon in water, A., ii, 351.
- estimation of water in mixtures of organic substances and sodium hydrogen carbonates, A., ii, 473.
- König, Josef, and B. Hünneke,** smallest amount of oxygen in water necessary to fish life, A., ii, 457.
- König, Josef, Alb. Spieckermann, and W. Bremer,** decomposition of fodder and food by micro-organisms. I. Organisms destroying fats, A., ii, 676.
- König, Josef.** See *Zdenko Hanns Skraup*.
- König, W. Chr.** See *A. Hegersheff*.
- Koenigs, Wilhelm, and Eduard Knorr,** derivatives of dextrose and of galactose, A., i, 369.
- Koenigsberger, Johann,** colouring matter of smoky quartz, A., ii, 167.
- Körber, Heinrich.** See *Wilhelm Wislicenus*.
- Kohler, Elmer P.,** molecular weight of aluminium compounds, A., ii, 21.
- Kohlhammer, Erich.** See *Adolf Pinner*.
- Kohlrausch, Friedrich,** electrical conductivity of solutions of the alkali iodates, and a formula for the calculation of the conductivity, A., ii, 221.
- Kohlrausch, Friedrich, and Margaret E. Maltby,** electrical conductivity of aqueous solutions of alkali chlorides and nitrates, A., ii, 82.
- Kohlschütter, Volkmar,** uranium red, A., ii, 165.
- occurrence of nitrogen and helium in uranium minerals, A., ii, 598.
- Kohlschütter, Volkmar, and H. Rossi,** urano-oxalic acid, A., i, 448.
- Kohn, Charles Alexander,** the electrolysis of copper sulphate as a basis for acidimetry, A., ii, 190.
- Kohn, Hugo.** See *Otto Ruff*.
- Kohn, Moriz,** condensation of isobutaldehyde with propaldehyde, A., i, 255.
- oxime of diacetoneamine, A., i, 367.
- Kohner, Emil,** action of formaldehyde and nascent hydrogen cyanide on anthranilic acid, A., i, 537.
- Kohnstamm, Ph.,** vapour pressures of binary mixtures in the light of van der Waals' theory, A., ii, 145.
- Kohnstamm, Ph., and B. M. van Dalsen,** vapour tensions of mixtures of ether and chloroform, A., ii, 641.
- Kolb, A.,** reduction of mercuric salts by hydrogen peroxide, A., ii, 160.
- Kolkwitz, K.,** respiration of quiescent seeds, A., ii, 570.
- Kollock, Lily G., and Edgar Francis Smith,** electrolytic estimation of molybdenum, A., ii, 694.
- electrolytic estimation of uranium, A., ii, 695.
- Komppa, Gustav,** condensation of ketones with ethyl cyanoacetate, A., i, 114.
- undecanedicarboxylic acid and the electrosynthesis of decanedicarboxylic acid, A., i, 365.
- complete synthesis of apocamphoric acid (camphopyric acid), A., i, 668.
- Kondakoff, Iwan L.,** abnormal behaviour of polyhaloid compounds with alcoholic potash, A., i, 62, 305.
- polymerisation of diisopropenyl, A., i, 625.
- artificial camphor and camphene, A., i, 646.
- Kondakoff, Iwan L., and N. Bachtschéeff,** ethereal oil of buchu leaves, and the constitution of its constituents, A., i, 334.
- Kondakoff, Iwan L., and Eugen Lutschinin,** fenchene and camphene, A., i, 282.
- Koninck, Lucien L. de,** estimation of nitrites and their separation from nitrates, A., ii, 73.
- estimation of ferrous oxide in silicates: influence of pyrites, A., ii, 284.
- potassium thiocyanate as indicator when reducing ferric salts, A., ii, 694.
- Koning, C. J.,** action of enzymes on chromatophores and dissolved dyes, A., i, 177.
- Konkorowitsch, L.** See *Carl Adam Bischoff*.
- Konowaloff, Michael I.,** nitrating action of nitric acid on derivatives of saturated hydrocarbons. II. Action of nitric acid on alcohols, A., i, 249.

- Konowaloff, Michael I.**, observations on oximes and their reduction to the corresponding amines, A., i, 281.
 — nitration by means of nitrates in presence of water, A., ii, 501.
- Konowaloff, Michael I.**, and (*Mme.*) **A. Plotnikoff**, composition of Grosny naphtha, A., i, 246.
- Koritzky, R.** See **Franz Kunckell**.
- Korn, A.** See **Karl A. Hofmann**.
- Kort, A.**, effect of gestation on the amount of mineral matter, especially phosphoric acid and calcium, in cow's milk, A., ii, 27.
- Korten, H.**, and **Roland Scholl**, ω -halogenacetophenone oximes, A., i, 549.
- Kóssa, Julius von**, action of phloridzin on the kidneys, A., ii, 31.
- Kossel, Albrecht** [**Carl Ludwig Martin Leonhard**], nucleohiston, A., i, 57, 299.
 — nucleic acids, A., i, 299.
 — proteids, A., i, 490.
- Kossel, Albrecht**, and **Er. Kutscher**, composition of proteids, A., i, 107.
- Kostanecki, Stanislaus von**, synthesis of luteolin, A., i, 335.
- Kostanecki, Stanislaus von**, and **Lorenzo Lyddon Lloyd**, studies in the chromone series, A., i, 735.
- Kostanecki, Stanislaus von**, **L. Paul**, and **Josef Tambor**, 7-hydroxychromone, A., i, 735.
- Kostanecki, Stanislaus von**, and **A. Rózycki**, formation of chromone derivatives, A., i, 222.
- Kostanecki, Stanislaus von**, **A. Rózycki**, and **Josef Tambor**, synthesis of luteolin, A., i, 92.
- Kostanecki, Stanislaus von**, and **J. Steuermann**, 5:7:3'-trihydroxyflavone, A., i, 223.
- Kostanecki, Stanislaus von**, and **Josef Tambor**, 3'-hydroxyflavone, A., i, 558.
- Kostanecki, Stanislaus von**, and **Josef Tambor**, [with **W. Orth**, **L. Paul**, and **W. Winter**], syntheses in the chromone group, A., i, 558.
- Kostanecki, Stanislaus von**, and **Franz Webel**, an isomeride of apigenin, A., i, 479.
- Kostanecki, Stanislaus von**. See also **E. Diller**.
- Kostin, S.**, detection of minute quantities of carbon monoxide in blood and air, A., ii, 281.
- Kostin, S.** See also **Nathan Zuntz**.
- Kostjainin, N. N.**, estimation of nitric acid in water, A., ii, 38.
- Kovář, František**, analyses of minerals from the neighbourhood of Polička, A., ii, 606.
- Kovář, František**, [analyses of Moravian minerals], A., ii, 606.
- Kowalewski, Katharina**, and **Sergei Salaskin**, formation of uric acid in the liver of birds, A., ii, 671.
- Kowalski, J. de**, and **Jean de Modzelewski**, refractive indices of mixtures of liquids, A., ii, 537.
- Kozai, Yoshinai**. See **Oscar Loew**.
- Kraatz-Koschlau, K. von**, and **Lothar Wöhler**, colours of minerals, A., ii, 166.
- Kraemer, Gustav**, and **Adolf Spilker**, insoluble coumarone- and indene-resins, A., i, 557.
- Kraemer, Gustav**, and **Rudolf Weissgerber**, diphenylene oxide in coal tar, and the derived diphenol, A., i, 535.
- Krafft, E. von**. See **Hans von Pechmann**.
- Krafft, Friedrich**, and **R. Funcke**, action of water on heptylamine soaps, A., i, 63.
- Krafft, Friedrich**, and **G. Heizmann**, derivatives of tetradecylacetylene, A., i, 110.
- Krafft, Friedrich**, and **R. Neumann**, replacements in the phosphorus-arsenic-antimony group, A., ii, 235.
- Krafft, Friedrich**, and **W. Rosiny**, preparation of the higher acid anhydrides, A., i, 113.
- Krafft, Friedrich**, and **R. Seldis**, transformation of α -undecenoic acid into θ -undecenoic acid and brassylic acid, A., i, 115.
- Krafft, Friedrich**, and **O. Steiner**, replacements in the sulphur-selenium-tellurium group, A., ii, 235.
- Krafft, Friedrich**, and **F. Tritschler**, derivatives of the higher unsaturated carboxy-acids, A., i, 115.
- Krafft, Friedrich**, and **W. Wilke**, isolation of sulphonic acids by vacuum distillation, A., i, 74.
- Krahe, W.** See **August Michaelis**.
- Kramer, Otto**. See **Friedrich Kehrman**.
- Kramers, G. H.** See **Frederick Pearson Treadwell**.
- Krannich, Carl**, benzophenone-*o*-sulphonic acid and some of its homologues, A., i, 153.
- Krup, A. F.** See **E. Helm**.
- Krassusky, K.**, mode of addition of hypochlorous acid to the olefines, A., i, 246.
- Kraus, manurial** experiments with ammonium sulphate and sodium nitrate, A., ii, 340.
- Kraus, E. H.**, some salts of the rare earths, A., ii, 453.

- Kraus, E. H.**, and **J. Reiting**, hussakite, a new mineral allied to xenotime, A., ii, 395.
- Krause, K.** See **Carl Adam Bischoff**.
- Krawkow, S.**, movement of water and solutions of salts in soil, A., ii, 73.
- Krazler, S.** See **Friedrich Kehrmann**.
- Krejčí, A.**, [tremolite from Pisek, Bohemia], A., ii, 607.
- Kremann, Robert.** See **Zdenko Hanns Skraup**.
- Kremers, Edward**, and **I. W. Brandel**, $\Delta^{1,4}$ -terpadiene-3-oxime-6-one (nitroso-thymol), A., i, 729.
- Kremers, Edward.** See also **I. W. Brandel**.
- Krenz, and Max Gerlach**, bacteria which destroy nitrates and their action in the soil, A., ii, 410.
- — — losses of nitrogen in fresh cow urine and cow dung kept in thin layers, alone and with straw, A., ii, 418.
- — — experiments with excrement, A., ii, 621.
- Kritzler, H.** See **Alexander Tschirch**.
- Kröber, E.**, estimation of pentosans by the hydrochloric acid phloroglucinol method, A., i, 371; ii, 288.
- Kromer, Nicolai**, formation of β -hydroxy- α -methylbutyric acid in the action of barium hydroxide on jalapin, A., i, 629.
- — — purgic acid, A., i, 629.
- — — acetyl derivatives of jalapin and jalapic acid, A., i, 647.
- — — occurrence of sucrose in the fruit of *Paris quadrifolia*, A., ii, 618.
- Krüger, Friedrich**, precipitability of proteids by chloroform, A., i, 621.
- — — electromotive force and osmotic pressure, A., ii, 145.
- — — quantitative action of pepsin, A., ii, 561.
- Krüger, Martin**, 6-methylxanthine, A., i, 170.
- Krüger, Martin**, and **Julius Schmid**, estimation of the nitrogen of amino-acids in urine, A., ii, 290.
- — — influence of caffeine and theobromine on the excretion of purine substances in urine, A., ii, 463.
- Krüger, W.**, and **W. Schneidewind**, are lower chlorophyllous algae able to assimilate free nitrogen and to increase the amount of nitrogen of the soil? A., ii, 411.
- — — cause and importance of decomposition of nitrates in soil, A., ii, 470.
- Kruh, O.** See **R. O. Herzog**.
- Krusch, P.**, tellurides of gold and silver from Western Australia, A., ii, 393.
- Kubierschky, K.**, explosion of mixtures of combustible vapours or fumes and air, A., ii, 232.
- Kügelgen, Fr. von**, reduction by means of calcium carbide, A., ii, 98, 448.
- Kühling, Otto**, volumetric estimation of phosphorous acid, A., ii, 38.
- — — behaviour of arsenious oxide towards permanganate, A., ii, 237.
- — — combined action of carbon dioxide and alkali salts on cupric oxide, A., ii, 656.
- Kühn, A.**, detection of indican in urine containing iodides, A., ii, 487.
- Kühn [Carl] Bernhard**, [and, in part, **W. Spindler**, and **P. von Gartzten**], new reaction of phosgene, A., i, 42.
- Kuenen, J. P.**, mixtures of hydrogen chloride and methyl ether, A., ii, 146.
- Küster, Friedrich Wilhelm**, the electrical arrangements of the chemical laboratory of the mining school at Clausthal, A., ii, 217.
- — — simultaneous deposition of iron and nickel from mixed solutions of their sulphates, A., ii, 555.
- Küster, Friedrich Wilhelm**, and **A. Thiel**, estimation of sulphuric acid in the presence of iron, IV., A., ii, 124.
- Küster, William**, constitution of the hæmatic acids, A., i, 58, 298.
- Kufferath, A.**, indicators for use with artificial light, A., ii, 684.
- Kullgren, Carl**, hydrolysis of salts, A., ii, 149.
- — — influence of non-electrolytes on the hydrolysis of ethyl acetate, A., ii, 496.
- Kunckell, Franz**, preparation of amino-hydroxy- and chloroaminohydroxy-ketones, A., i, 213.
- — — preparation of substituted iminazoles [glyoxalines], A., i, 293.
- Kunckell, Franz**, and **R. Bauer**, phenacylidenebenzamidine and some homologues, A., i, 758.
- — — action of benzamidine on certain aromatic aldehydes, A., i, 759.
- Kunckell, Franz**, and **P. Donath**, 1:2:4-substituted iminazoles, A., i, 567.
- Kunckell, Franz**, and **K. Eras**, some chloromethoxystyrenes, A., i, 75.
- Kunckell, Franz**, and **A. Hildebrandt**, 1:3:5-triacetylated benzenehydrocarbon and some compounds of dichloroacetylmesitylene, A., i, 552.
- Kunckell, Franz**, and **R. Koritzky**, $\alpha\beta$ -dichlorostyrenes and some acetylenes, A., i, 75.
- Kunckell, Franz**, and **Robert Zimmermann**, selenium derivatives of aromatic ketones, A., i, 214.

- Kunlin, Julius.** See *Emil Erlenmeyer, jun.*
- Kunz, J.** See *Alfred Werner.*
- Kunz, Rudolf,** estimation of lactic anhydride in lactic acid, A., ii, 428.
— occurrence and estimation of lactic acid in wines, A., ii, 700.
- Kupzis, J.,** minimum quantity of oxygen required by fish; poisonous quantities of carbon dioxide in the water, A., ii, 665.
- Kuraéeff, D.,** iodohæmoglobin, A., i, 298.
— coagulating action of papayotin on solutions of peptone, A., i, 435.
— protamine from *Aceipenser stellatus*, A., ii, 462.
- Kurnakoff, Nicolai S.** See *S. Schemtschuschny.*
- Kursanoff, Nicolai,** propylhexamethylene, A., i, 493.
— haloid derivatives of menthol, and hydrocarbons derived from them, A., i, 553.
- Kutscher, Fr.,** decomposition products of proteids, A., i, 107.
— antipeptone, A., i, 108, 354.
— conversion of dextrorotatory arginine into its optically inactive isomeride, A., i, 561.
— oxidation products of arginine, II., A., i, 561.
— autofermentation of yeast, A., ii, 466.
— yeast trypsin, A., ii, 523.
- Kutscher, Fr., and John Seemann,** digestion in the small intestine, A., ii, 667.
- Kutscher, Fr.** See also *Elophé Bénech*, and *Albrecht Kossel.*
- Kym, Otto,** benzazoles and dyes derived from them, A., i, 47.

L.

- Laar, J. J. van,** development of the thermodynamical potential in terms of *ue* and *p* in the case of compound components, A., ii, 224.
- Laband, L.,** occurrence of zinc in the vegetable kingdom, A., ii, 467.
- Lacroix, Alfred,** manganese minerals from Hautes-Pyrénées, A., ii, 395.
- Ladd, E. F.** See *Harry S. Grindley.*
- Ladenburg, Albert,** hydrogenation with sodium and alcohol, A., i, 181.
— method for determining the molecular weight of ozone, A., ii, 232.
— density of ozone, A., ii, 499.
- Ladenburg, Albert, and Reinhold Quasig,** estimation of ozone, A., ii, 420.
- Ladenburg, R.,** determination of the dielectric constants of some substances of the pyridine and piperidine series by Drude's method, A., ii, 634.

LXXX. ii.

- Lajoux, Henri,** human colostrum, A., ii, 671.
- Lamar, William R.,** assay of coca, A., ii, 631.
- Lambert, M., and Léon Garnier,** action of chloroform on the reducing power of blood, A., ii, 257.
- Landau, Josef.** See *Carl Liebermann.*
- Lander, George Druce,** alkylation of acylarylamines, T., 690; P., 1901, 59.
— preparation of aliphatic iminoethers from amides, T., 701; P., 1901, 61.
— action of dry silver oxide and ethyl iodide on benzoylactic ester, deoxybenzoin, and benzyl cyanide, P., 1901, 59.
- Landriset, E.** See *Arnold Rossel.*
- Lang, S.,** excretion of nitrogen after extirpation of the liver, A., ii, 407.
- Langbein, Hermann,** chemical and calorimetric analysis of fuel, A., ii, 128.
- Lange, Cornelia de,** composition of the ash of milk and of the newborn child, A., ii, 174.
- Lange, O.** See *Alexander Eibner.*
- Langer, Friedrich,** tautocinchonine, A., i, 403.
— bases analogous to nichine from cinchonine, A., i, 403.
- Langguth, Werner.** See *Fritz Fichter.*
- Langley, John Newport,** stimulation and paralysis of nerve-cells and nerve-endings, A., ii, 671.
— physiological action of suprarenal extract, A., ii, 673.
- Langstein, Leo,** the carbohydrate group of crystallised egg-albumin, A., i, 108.
- Langstein, Leo.** See also *Sigmund Fränkel*, and *Karl Glaessner.*
- Lanser, Theodor.** See *Carl Liebermann.*
- Lapworth, Arthur,** the form of change in organic compounds and the function of the α -meta-orientating groups, T., 1265; P., 1900, 108, 132; 1901, 2, 93, 95.
— note on isomeric change and meta-substitution in benzenoid amines, P., 1901, 2.
- Lapworth, Arthur, and Edgar Marsh Chapman,** $\alpha\alpha$ -hydroxycamphorcarboxylic acid, T., 377; P., 1901, 28.
- Lapworth, Arthur, and Walter Henry Lenton,** the constitution of camphanic acid and of bromocamphoric anhydride, T., 1284; P., 1901, 37.
— — the constitution of the acids obtained from α -dibromocamphor, P., 1901, 148.
- Larter, A. T.,** displacement of alkyls from phenols by nitration. I. Thymol, P., 1901, 183.

- Lasne, Henri**, composition of amblygonite, A., ii, 455.
- Lauder, Alexander**. See *James Johnstone Dobbie*, and *Walter Noel Hartley*.
- Lauffer, E.** See *Otto Wallach*.
- Lauffer, H.** See *Otto Wallach*.
- Laurent, Jules**, exosmosis of diastase by young seedlings, A., ii, 69.
- Lawes, Sir John Bennet**, obituary notice of, T., 873, 890.
- Lawrence, William Trevor**, and *William Henry Perkin, jun.*, formation of aromatic compounds from ethyl glutamate and its derivatives: the reduction of trimesic acid and the conversion of tetrahydrotrimesic acid into tetrahydroisophthalic acid, P., 1901, 47.
- Lawrence, William Trevor**. See also *William Carter*.
- Lawroff, D.**, decomposition products of oxyhemoglobin from horses, A., i, 243.
- excretion of antipyrine, A., ii, 463.
- peptic and tryptic digestion of proteid, A., ii, 666.
- Lax, W.**, derivatives of ethyl phenylhydrazonocetyanoacetate, A., i, 230.
- Leather, J. Walther**, composition of the milk of Indian cows and buffaloes, A., ii, 291.
- Lebbin, Georg**, new process for the estimation of glycogen, A., ii, 45.
- Lebeau, Paul**, a new cobalt silicide, A., ii, 242.
- constituents of commercial ferro-silicons, A., ii, 317.
- Lebeau, Paul**. See also *Henri Moissan*.
- Le Bon, Gustave**, alterations in the chemical properties of elements produced by the addition of traces of foreign substances, A., ii, 20.
- Le Comte, Octave**, estimation of fat in milk by means of anhydrous sodium sulphate, A., ii, 359.
- Lederer, Anton**, action of barium hydroxide and of sodium on several aldehydes, A., i, 669.
- Ledoux, L.**, estimation of phosphoric acid in phosphatic manures, by precipitation in the cold as ammonium phosphomolybdate, A., ii, 576.
- Lee, Theophilus Henry**, note on tecomin, a colouring matter derived from the heart-wood of *Bignonia Tecoma*, T., 284; P., 1901, 4.
- Lees, Charles H.**, viscosities of mixtures of liquid and solutions, A., ii, 148.
- Lees, Frederick H.**, and *William Henry Perkin, jun.*, the action of aluminium chloride on camphoric anhydride, T., 332; P., 1898, 111; 1899, 23; 1900, 18.
- Lees, Frederick H.** See also *Samuel Barnett Schryver*.
- Lefebvre, Pierre**, alcohols and calcium carbide, A., i, 441.
- Lefèvre, Léon**. See *Edouard Grimaux*.
- Léger, Eugène**. See *Émile Jungfleisch*.
- Legrand**, analysis of calculi from the pancreas, A., ii, 566.
- Legros, G.** See *Léon Grimbert*.
- Lehfeldt, R. A.**, electromotive force and osmotic pressure, A., ii, 4.
- electrolytic solution pressure, A., ii, 5.
- Jahn's measurement of the E.M.F. of concentration cells, A., ii, 433.
- Lehmann, Erich**. See *Wilhelm Traube*.
- Lehmann, Franz**, sugar as food for cattle, A., ii, 415.
- fish meal and its future in Germany, A., ii, 469.
- Lehmann, Fritz**, condensation of benzaldehydecyanohydrin with urethane, A., i, 275.
- Lehmann, Hans**, infra-red spectra of the alkalis, A., ii, 142.
- Lehmann, Martin**. See *Arthur Hantzsch*.
- Lehmann, P.** See *Rudolph F. Weinland*.
- Leidié, Émile**, general method of separating the metals that accompany platinum, A., ii, 62.
- Leidié, Émile**, and *Quennessen*, estimation of platinum and iridium in platinum ore, A., ii, 695.
- Leighton, Virgil L.** See *Arthur Michael*.
- Leimbach**. See *Otto Wallach*.
- Leiser, R.** See *R. O. Herzog*.
- Lemcke, Alfred**, hemp cake, A., ii, 272.
- Lémeray**, relation between expansion and melting points of metals, A., ii, 145.
- Lemme, Georg**. See *Ferdinand Tiemann*.
- Lemmermann, Otto**, processes of denitrication, A., ii, 524.
- Lemmermann, Otto**. See also *Theodor Pfeiffer*.
- Lemoult, Paul**, relation between the chemical constitution of triphenylmethane colouring matters and the absorption spectra of their aqueous solutions, A., i, 100.
- absorption spectra of indophenols: law of auxochromic groups containing tertiary nitrogen, A., i, 232.
- the law of auxochromes, A., i, 351.
- reaction between substituted aminobenzophenones and aromatic amines in presence of sulphuric acid, A., i, 425.
- Lenher, Victor**, sulphohaloids of lead, A., ii, 654.
- Lenormand, C.** See *E. Bodin*.

- Lenton, *Walter Henry*. See *Arthur Lapworth*.
- Leoncini, *Giovanni*. See *Mario Betti*.
- Leonhardt, *A.*, & Co. See *Farbwerk Mülheim vorm. A. Leonhardt & Co.*
- Lepierre, *Charles*, glucoproteins as new chemically definite culture media for the study of micro-organisms, *A.*, i, 622.
- estimation of phosphates in potable waters, *A.*, ii, 689.
- Lépine, *Raphael*, and *Boulud*, maltosuria in a diabetic patient, *A.*, ii, 409.
- the sugars of the blood, *A.*, ii, 610.
- Leroy, *Émile*, thermochemical researches on the principal opium alkaloids, *A.*, ii, 6.
- Leser, *Georges*, cyclic β -diketones, *II.*, *A.*, i, 278.
- Lessing, *Rudolf*. See *Richard Willstätter*.
- Le Sueur, *Henry Roudel*, the products of the action of fused potassium hydroxide on dihydroxystearic acid, *T.*, 1313 ; *P.*, 1900, 91.
- Leteur, *F.*, action of hydrogen sulphide on acetylacetone, *A.*, i, 581.
- Leupold, *Ernst*, [derivatives of] some unsaturated aromatic acids, *A.*, i, 711.
- Levene, *P. A.*, composition of nucleic acids, *A.*, i, 299.
- ichthulin from the cod, *A.*, i, 433.
- chemical nature of trypsin, *A.*, i, 576.
- preparation and analysis of some nucleic acids, *A.*, i, 623.
- biochemical studies on the tubercle bacillus, *A.*, ii, 675.
- Levene, *P. A.*, and *C. Alsberg*, parannucleic acid, *A.*, i, 300.
- Levene, *P. A.*, and *Lafayette B. Mendel*, decomposition products of edestin, *A.*, i, 656.
- Levene, *P. A.* See also *E. R. Baldwin*.
- Levi, *M. G.*, basic energy of silver oxide in solution, *A.*, ii, 654.
- Levi, *M. G.* See also *Giacomo Carrara*.
- Levin, *Isaac*, blood of animals deprived of their suprarenals, *A.*, ii, 256, 518.
- Levinstein, *Limited*, benzaldehyde-*o*-sulphonic acid, *A.*, i, 725.
- Levy, *Arthur Garfield*, analysis of samarskite, *A.*, ii, 281.
- Lewin, *Carl*, hippuric acid metabolism in man, *A.*, ii, 518.
- Lewis, *Gilbert Newton*, a new conception of thermal pressure and a theory of solution, *A.*, ii, 10.
- law of physico-chemical processes, *A.*, ii, 639.
- Lewis, *Thomas*. See *Swale Vincent*.
- Lewkowitsch, *Julius*, estimation of glycerol, *A.*, ii, 285.
- examination of varnish resins, *A.*, ii, 292.
- Ley, *Heinrich*, hydroxyamidines, *A.*, i, 759.
- Leyden, *Paul*. See *Eugen Bamberger*.
- Leys, *Alexandre*, new reaction of "saccharin" (*o*-benzoisulphinide), *A.*, ii, 488.
- Lichtenfeld, *H.*, value of proteid in nutrition, *A.*, ii, 609.
- nutrition during training, *A.*, ii, 609.
- Lidoff, *Alexander P.*, action of nitrous acid on wool, *A.*, i, 243.
- Lieben, *Adolf*, condensation of aldehydes, *A.*, i, 449.
- Liebermann, *Carl* [*Theodor*], eupittone and pittakall, *A.*, i, 384.
- dyeing with oxidic mordants, *A.*, i, 478.
- dihydroxyfluorescein, *A.*, i, 595.
- theory of colour shade, *A.*, ii, 368.
- Liebermann, *Carl*, and *Josef Landau*, carminone compounds, *A.*, i, 545.
- hydroxytrisdiketohydrindene, *A.*, i, 552.
- Liebermann, *Carl*, and *Theodor Lanser*, the fluorescent substance derived from ethyl 2-bromo- α -naphthaquinone-3-acetoacetate, *A.*, i, 465.
- Liebermann, *Carl*, and *Fritz Wiedemann*, derivatives of eupittone [hexamethoxyaurin], *A.*, i, 384.
- colouring matters of the resacetin series, *A.*, i, 736.
- Liebermann, *J.* See *Carl Adam Bischoff*.
- Liebig, *Max*, volumetric estimation of lead dioxide in red lead, *A.*, ii, 692.
- Liew, *Randolph van*, sources of loss in the estimation of gold and silver in copper bars, and a method for its avoidance, *A.*, ii, 41.
- Lillie, *Ralph*, action of various salts on ciliary and muscular movements in arenicola larvæ, *A.*, ii, 179.
- Limpach, *Leonhard*. See *Paul Gordan*.
- Limpricht, *Heinrich*, *p*-methyl-*o*-benzylbenzoic acid, *A.*, i, 145.
- tolylphthalide, *A.*, i, 146.
- Lincoln, *Azariah T.*, solvent action of vapours, *A.*, ii, 89.
- Linde, *Otto*. See *Julius Tröger*.
- Lindeck, *Stephan*. See *Wilhelm Jaeger*.
- Lindenbaum, *S.*, action of 2:3-dibromo- α -naphthaquinone on *o*-, *m*-, and *p*-phenylenediamine and some new derivatives of $\alpha\beta$ -naphthaphenazine, *A.*, i, 423.
- Lindet, *Léon*, estimation of dextrose and dextrin in commercial glucose, *A.*, ii, 134.

- Lindfield, James Henry.** See *John Theodore Hewitt*.
- Lindner, Paul,** fermentation experiments with various yeasts and sugars, A., ii, 182, 263.
- Lindsay, Charles F.,** conductivities of some double salts as compared with the conductivities of mixtures of their constituents, A., ii, 143.
- presence of acid sulphate of copper in mixtures of aqueous solutions of sulphuric acid and copper sulphate, A., ii, 386.
- Ling, Arthur R., and Thomas Henry Pope,** refractometric method of determining alcohol and solid matter in beer, A., ii, 628.
- Linossier, Georges,** elimination of sodium salicylate by the bile, A., ii, 564.
- Lipliawsky, S.,** new method of detecting acetic acid in urine, A., ii, 428.
- Lipp, Andreas,** 2-ethylpiperidine and its properties, A., i, 162.
- Lippert, Walther, and H. Reissiger,** acid and saponification numbers of some copals, A., ii, 50.
- Lippmann, Edmund O. von,** occurrence of quinic acid, A., i, 389.
- inversion of cane sugar, A., ii, 89.
- Lippmann, Eduard, and Paul Keppich,** the ketones of anthracene, A., i, 37.
- Lippmann, Eduard, and Isidor Pollak,** action of sulphur monochloride on anthracene, A., i, 690.
- — preparation of anthraphenone, A., i, 728.
- Lipschitz, Alfred.** See *Rudolf Wegscheider*.
- Litterscheid, Franz M.,** chloro- and bromo-methyl alcohols, A., i, 443.
- ammonio-compounds of cupric and cuprous thiocyanates, A., i, 635.
- Liveing, George Downing, and James Dewar,** spectrum of the more volatile gases of atmospheric air which are not condensed at the temperature of liquid hydrogen, A., ii, 213.
- — separation of the least volatile gases of atmospheric air, and their spectra, A., ii, 598.
- Liverseege, John F.,** approximate estimation of formaldehyde in milk, A., ii, 483.
- Liversidge, Archibald,** crystalline structure of silver and copper nuggets, A., ii, 662.
- crystalline structure of gold nuggets, A., ii, 662.
- Ljubarsky, Eugen,** hydrocarbon, C_6H_{10} , from dimethylallylcarbinol, A., i, 181.
- Lloyd, H. D.** See *Allen Cleghorn*.
- Lloyd, Lorenzo Lyddon.** See *Frederic Stanley Kipping, and Stanislaus von Kostanecki*.
- Lobry de Bruyn, C. A.** See *Bruyn*.
- Locke, James,** gradations in the properties of alums, A., ii, 656.
- Lockyer, Sir Joseph Norman, and F. E. Baxandall,** arc spectrum of vanadium, A., ii, 489.
- Loczka, Jozsef,** analysis of tetrahedrite from Mount Botes, Hungary, A., ii, 247.
- Loeb, Jacques,** transformation and regeneration of organs, A., ii, 177.
- artificial parthenogenesis, A., ii, 177.
- a new form of muscular irritability, A., ii, 519.
- Löb, Walther,** electrolytic preparation of benzidine, A., i, 487.
- pyrogenetic reactions induced by the electric current, A., ii, 371.
- Loeben, Wolf von.** See *Emil Fischer*.
- Loebisch, Wilhelm F.,** influence of urotropine on intestinal putrefaction, A., ii, 667.
- Loebner, Paul.** See *August Michaelis*.
- Löhr, H.,** estimation of camphor in camphor oil, A., ii, 361.
- Løper.** See *G. Meillère*.
- Loevenhart, A. S.,** lipase, A., ii, 253.
- Loevenhart, A. S.** See also *J. H. Kastle*.
- Loevy, J.,** estimation of gold and silver in pyrites, A., ii, 133.
- Loew, Oscar,** catalase, a new enzyme of general occurrence, with special reference to the tobacco plant, A., i, 435.
- Loew, Oscar, and Yoshinari Kozai,** physiology of *Bacillus pyocyaneus*, A., ii, 675.
- Löwenherz, Richard,** decomposition by sodium of organic halogen compounds dissolved in ethyl alcohol, A., ii, 308.
- Loewi, Otto,** nucleic metabolism, A., ii, 325.
- Loewy, A., and Franz Müller,** metabolic studies in man, A., ii, 609.
- Löwy, Victor, and Fritz Winterstein,** action of sulphuric acid on the glycol from isobutaldehyde and isovaleraldehyde, A., i, 626.
- Logan, Lily.** See *Hermann T. Vulté*.
- Loges, Gustav, and Karl Mühle,** estimation of the acidity in fodder fats, A., ii, 702.
- Long, John Harper,** estimation of urea in urine, A., ii, 705.
- Longinesca, G. G.,** observations on the boiling points of some organic liquids, A., ii, 610.
- Loomis, Elmer Howard,** freezing point of aqueous solutions of non-electrolytes, II., A., ii, 492.

Lopresti, *Francesco*, detection of alum in wines, A., ii, 198.

Lordkipanidzé, *S.* See *Pavel Iv. Petrenko-Kritschenko*.

Lorenz, *Fritz*. See *Leopold Specht*.

Lorenz, *Norbert von*, detection of mineral phosphates in basic slags, A., ii, 193.

— estimation of phosphoric acid in manures, soils, and ashes, by the direct weighing of the phosphomolybdate, A., ii, 278.

Lorenz, *P.* See *Chr. Tarnuzzer*.

Lorenz, *Richard*, theory of the decomposition potentials of fused salts, A., ii, 142.

— electrolysis of fused salts, A., ii, 538.

Lossen, *Wilhelm [Clemens]*, and *A. Treibich*, addition of bromine to acetylenedicarboxylic acid, A., i, 632.

Lotmar, *H.*, hydration of dissolved substances, A., ii, 12.

Louise, *Emile*, and *Riquier*, calculations employed in the analyses of skimmed and diluted milk, A., ii, 429.

Lowry, *T. M.* See *Henry Edward Armstrong*.

Lublin. See *Antoine Paul Nicolas Franchimont*.

Lucas, *Maurice*, estimation of oxygen in commercial copper, A., ii, 124.

Lucchesi, *Adolfo*. See *Ubaldo Antony*.

Ludwig, *Ernst*, and *Theodor Panzer*, hot springs of Gastein, A., ii, 114.

Luebert, *A. Gustav*, modification of the sulphuric acid test for formaldehyde in milk, A., ii, 703.

Luedecke, *C.*, conditions of soil and water in the Province Rheinhessen in the Rheingau and Taunus, A., ii, 417.

Lührig, *H.*, estimation of fat in fæces, A., ii, 208.

— volumetric estimation of boric acid, A., ii, 280.

Luginin, *Wladimir F.*, latent heats of vaporisation of some carbon compounds, A., ii, 145.

Lumia, *C.*, diffusion of enzymes in the seeds, with special reference to the fat-decomposing enzymes, A., ii, 33.

Lumière, *Auguste*, *Louis Lumière*, and *Chevrotier*, mercury-organometallic compounds, A., i, 244.

Lumière, *Auguste*, *Louis Lumière*, and *F. Perrin*, action of mercuric oxide on some organic substances, A., i, 356.

Lummerzheim, *Max*. See *Berthold Rassow*.

Lumsden, *John S.* See *James Walker*.

Lunge, *Georg*, testing of Weldon-deposit, A., ii, 198.

Lunge, *Georg*, du Pont's nitrometer, A., ii, 278.

Lunge, *Georg*, and *J. Bebie*, nitrocelluloses, A., i, 508.

Luschnikoff, *M.* See *Nicolaus I. Demjanoff*.

Luther, *Robert*, electromotive behaviour of substances with several stages of oxidation, II., A., ii, 301.

Lutschinin, *Eugen*. See *Iwan L. Kondakoff*.

Lutz, *Oskar*, action of ammonia and amines on halogen-succinic acids, A., i, 7.

Lyle, *H. Willoughby*, veratrine-like action of glycerol, A., ii, 181.

Lyon, *Albert C.* See *William Albert Noyes*.

Lythgoe, *Hermann C.*, rapid method for the detection of aniline-orange in milk, A., ii, 139.

M.

Maas, *J. J. M.*, some colour reactions of citrophen, phenacetin, methacetin, acetanilide, and exalgin with potassium permanganate, A., ii, 210.

Mabery, *Charles Frederic*, composition of Texas petroleum, A., i, 441.

Mabery, *Charles Frederic*, and *Otto J. Sieplein*, chlorine derivatives of the hydrocarbons in California petroleum, A., i, 306.

— comparative method for determining the fusing points of asphalts, A., ii, 352.

Macadam, *Stevenson*, obituary notice of, T., 897.

McCaffrey, *Charles F.* See *Theodore William Richards*.

McCay, *Le Roy Wiley*, action of alkali hydroxides and alkaline earths on arsenic pentasulphide, A., ii, 95.

McCrae, *John*, ethyl sec-octyl tartrate and its dibenzoyl and diacetyl derivatives, T., 1103; P., 1901, 186.

McCrae, *John*. See also *Harry Medforth Dawson*.

Macfadyen, *Allan, George Harris Morris*, and *Sydney Rowland*, expressed yeast-cell plasma (Buchner's "zymase"), A., i, 59.

McGill, *A.*, proximate analysis of cloves, A., ii, 432.

MacGregor, *James Gordon*, diagram of freezing point depressions for electrolytes, A., ii, 8.

— depression of the freezing point in aqueous solutions of electrolytes, A., ii, 223.

- MacIvor, R. W.** *Emerson*, native tellurium from Hannan's District, Western Australia, A., ii, 167.
- Mack, Edouard**, isochores of ether from 1 c.c. to 1.85 c.c., A., ii, 438.
- McKee, Ralph H.**, oxygen ethers of the carbamides; methyl- and ethyl-isocarbamide, A., i, 755.
- McKenzie, Alexander**, the esterification of 3-nitrophthalic acid, T., 1135; P., 1901, 186.
- McKenzie, Alexander.** See also *Willy Markwald*.
- Mackenzie, John Edwin**, the action of sodium methoxide and its homologues on benzophenone chloride and benzal chloride, T., 1204; P., 1901, 150.
- McLauchlan, William Henry**, preparation of thio-oxyarsenates, A., ii, 552.
- McLennan, J. C.**, electrical conductivity in gases exposed to the action of cathode rays, A., ii, 490.
- Macleod, J. J. R.**, metabolism of creatinine, A., ii, 115.
- McPherson, William, and Herbert C. Gore**, constitution of the hydroxyazo-compounds, A., i, 572.
- Madan, Henry George**, the colloid form of piperine, with special reference to its refractive and dispersive powers, T., 922; P., 1901, 127.
- Madsen, Thorvald**, dependence of hydrolysis on temperature, A., ii, 228.
- Macy, E.**, the specific volume as the determining criterion of chemical combination in metal alloys, A., ii, 655.
- new determination of the density of copper-tin, copper-zinc, and tin-zinc alloys, A., ii, 655.
- Magnier de la Source, Louis.** See *Armand Gautier*.
- Magnus, R.**, diuretic action of isotonic salt solutions, A., ii, 67.
- Magnus, R., and Edward Albert Schäfer**, action of pituitary extract on the kidney, A., ii, 612.
- Mailhe, A.**, action of mercuric oxide on aqueous solutions of metallic salts, A., ii, 452, 509.
- action of cupric hydroxide on solutions of metallic salts, A., ii, 601.
- Maillard, Louis**, indoxylie origin of certain red colouring matters of urine (indirubin), A., ii, 407.
- Mainsbrecq, F.**, analysis of tin and tin-plated wares, A., ii, 41.
- Mainzer, J.** See *Friedrich N. Schulz*.
- Maitland, W.** See *Francis Robert Japp*.
- Majewski, Karl von.** See *Hans Rupe*.
- Makgill, R. H.**, neutral-red as a means of detecting *Bacillus coli* in water, A., ii, 696.
- Maldès.** See *Gustave Massol*.
- Maldotti, Guido**, trinitrothymol and its derivatives, A., i, 80.
- Malfatti, Hans**, peptic digestion, A., ii, 67.
- Malfitano, G.**, protease of *Aspergillus niger*, A., i, 58.
- Mallet, John William**, formation of platinum tetrachloride from aqueous hydrochloric acid by atmospheric oxidation in contact with platinum black, A., ii, 454.
- Malméjac, F.**, action of alcohol on metals, A., i, 248.
- new alkaloid from the elder tree, A., i, 607; ii, 572.
- analysis of liquid obtained from a hydatid cyst of the liver, A., ii, 408.
- composition of a liquid obtained by tapping, A., ii, 520.
- albumins in dropsical pus, A., ii, 566.
- milk from [cows grazing on] the plateau of Sétif (Algeria), A., ii, 572.
- Malpeaux, L.**, cultivation of leguminous plants, A., ii, 270.
- inoculation of the soil with alinit, A., ii, 417.
- Maltby, Margaret E.** See *Friedrich Kohlrausch*.
- Mamlock, Leonard, and Richard Wolfenstein**, action of hydrogen peroxide on fatty amines, II., A., i, 673.
- Manasse, E.**, analysis of limonite from Monte Valerio, A., ii, 394.
- Manchot, Wilhelm**, the rendering active ("Activierung") of oxygen, A., ii, 93.
- Manchot, Wilhelm**, [with F. Glaser], formation of active oxygen by ferrous oxide, A., ii, 549.
- Manchot, Wilhelm, and Johannes Herzog**, oxidation of indigo-white with oxygen, A., i, 565.
- auto-oxidation of hydrazobenzene, A., i, 574.
- mechanism of the reaction on oxidation by gaseous oxygen, A., ii, 549.
- Manchot, Wilhelm, and O. Wilhelms**, peroxides of iron and the catalytic action of iron salts, A., ii, 658.
- Mangler, Georg.** See *Emil Fromm*.
- Manley, J. J.** See *Victor Herbert Veley*.
- Manoukian, Wahan**, action of *p*-xylylene bromide on some primary, secondary, and tertiary amines and alkaloids, A., i, 528.
- Manseau**, characteristic reaction of phenol, A., ii, 697.
- Manthey, W.**, condensation of α -bromoalocinnamic acid, A., i, 31.

- Manuelli, *C.*, lapachonone, III., A., i, 216.
- Manuelli, *C.*, and *M. Galloni*, quinoxaline group, I., A., i, 413.
- Manuelli, *C.*, and *V. Recchi*, action of urethane on aromatic diamines, A., i, 49.
- Maquenne, *Léon*, and *Gabriel Bertrand*, active erythritols, A., i, 497.
- racemic erythritol, A., i, 497.
- Maquenne, *Léon*, and *E. Roux*, new base derived from glucose, A., i, 372.
- Marc, *R.* See *E. Baur*.
- March, *Fr.*, ethyl diacetylpropionate, A., i, 312.
- action of bromoacetophenone on sodioacetylacetone, A., i, 596.
- Marchis, *L.*, gradual change of glass and the variation of the zero point of thermometers. II. Accurate thermometry, A., ii, 491.
- Marchlewski, [*Paul*] *Leon* [*Theodore*], and *J. Buraczewski*, studies on isatin, A., i, 347.
- Marchlewski, *Leon*, and *L. G. Radcliffe*, isatin, VII., A., i, 416.
- Marchlewski, *Leon*, and *J. Sosnowski*, isatin and its derivatives, A., i, 415, 615.
- Marchlewski, *Leon*. See also *Marcellus Nencki*.
- Marck, *J. L. B. van der*, *Samadera indica*, A., ii, 71, 334.
- Marckwald, *E.* See *Richard Jos. Meyer*.
- Marckwald, *Wilhelm*, and *Michael Chain*, preparation of morpholine, A., i, 380.
- morpholine and its derivatives, A., i, 741.
- Marcuse, *Arthur*, and *Richard Wolfenstein*, stereochemistry in the piperidine series, II., A., i, 608.
- hydrogen peroxide, A., i, 608.
- Marcusson, *J.* See *D. Holde*.
- Margulies, *Otto*, Neumann's modification of Fischer's phenylhydrazine test for the detection of sugar in urine, A., ii, 135.
- Marie, *Ch.*, action of hypophosphorous acid on acetone, A., i, 635.
- Marino, *L.* See *Augusto Piccini*.
- Marko, *Dmitri*, pentahydric alcohol from propyldiallylcarbinol, A., i, 251.
- Markownikoff, *Wladimir B.*, congratulatory address to, and his reply, P., 1901, 1, 83.
- Mark-Schnorf, *Fr. R.*, two pure peptogens, A., ii, 401.
- Markwald, *Willy*, separation of the amyl alcohols contained in fusel oil, I., A., i, 248.
- Markwald, *Willy*, and *Alexander McKenzie*, separation of the amyl alcohols contained in fusel oil, II., A., i, 248.
- fractional esterification and hydrolysis of stereoisomerides, A., ii, 229.
- Marpmann, *Georg*, the bio-chemical arsenic test, A., ii, 125.
- optical examination of fats and waxes, A., ii, 431.
- Marquardt, *Albert*, estimation of metallic iron in reduced iron, A., ii, 693.
- Marquis, *R.*, nitrofurfuran, A., i, 222.
- Marshall, *Hugh*, action of silver salts on ammonium persulphate solution, A., ii, 156.
- arrangements for electrolytic analysis, A., ii, 190.
- volumetric estimation of thallium, A., ii, 196.
- the detection and estimation of minute quantities of manganese, A., ii, 350.
- Martin, *Charles James*, and [*David*] *Orme Masson*, the influence of cane sugar on the conductivities of solutions of potassium chloride, hydrogen chloride, and potassium hydroxide, with evidence of salt formation in the last case, T., 707; P., 1901, 91.
- Martin, *G.*, on a theory of chemical combination, P., 1901, 169.
- Martinand, *V.*, presence of invertin of sucrase in grapes, A., ii, 35.
- Martin-Claude. See *R. Truchon*.
- Martine, *Camille*, action of benzaldehyde on sodiomethylol; new methods of preparing benzylidenementhone, A., i, 599.
- Martinotti, *C.*, and *L. Cornelio*, iron citrate and iron ammonium citrate, A., i, 667.
- Martre. See *Denoyés*.
- Mascarelli, *L.* See *Giuseppe Testoni*.
- Mascetti, *E.* See *Arturo Miolati*.
- Maselli, *C.*, chloro-derivatives of *o*-benzoicaphenide, A., i, 271.
- Massa, *C.* See *Guido Pellizzari*.
- Massaciu, *Cornelius*. See *Alfred Stock*.
- Massol, *Gustave*, acidimetric value of monosubstituted benzoic acids, A., i, 323.
- thermochemistry of *o*- and *p*-bromobenzoic acids, A., i, 323.
- thermochemistry of *o*-chlorobenzoic acid, A., ii, 226.
- thermochemistry of *o*-iodobenzoic acid, A., ii, 226.
- acidimetric value (avidity) of *p*-sulphanilic acid, A., i, 532.

- Massol, Gustave**, and **Maldès**, solubility of mixtures of copper sulphate and sodium sulphate, A., ii, 594.
- Masson, [David] Orme**. See **Charles James Martin**.
- Masson, Henri**, syntheses of tertiary alcohols of the fatty series, A., i, 249.
- Maszewski, T.**, ptyalin activity, A., i, 178.
- Mathews, Albert P.**, division of unfertilised eggs, A., ii, 28.
- salivary secretion, A., ii, 176.
- artificial parthenogenesis, A., ii, 665.
- Matignon, Camille**, combination of nitrogen with metals of the rare earth group, A., ii, 60.
- direct combination of hydrogen with the metals of the rare earths, A., ii, 61.
- neodymium chloride, A., ii, 602.
- Matignon, Camille**, and **Marcel Delépine**, composition of thorium hydride and nitride, A., ii, 106.
- Matteucci, Raff. Vittorio**, simultaneous production of two nitrogen compounds in the crater of Vesuvius, A., ii, 63.
- Matthes, Hermann**, alcohol bases, A., i, 259, 513.
- Matthews, Francis Edward**, 2:3:5-trichlorobenzoic acid, T., 43; P., 1900, 187.
- Matthey, Edward**, preparation of large quantities of tellurium, A., ii, 447.
- Matuschek, J.**, action of hydrofluosilicic acid on potassium ferrocyanide, A., i, 262.
- action of hydrofluosilicic acid on potassium ferri-cyanide, A., i, 454.
- influence of light on the decomposition of aqueous solutions of potassium ferri-cyanide, A., i, 455, 584.
- action of sunlight on aqueous solutions of potassium ferrocyanide, A., i, 635.
- action of sulphur dioxide on [aqueous solutions of] potassium ferrocyanide, A., i, 635.
- action of sulphur dioxide on aqueous solutions of potassium ferri-cyanide, A., i, 635.
- comparative experiments on the intensity of the action of light on aqueous solutions (containing equal amounts of iron) of potassium ferrocyanide and ferri-cyanide, A., i, 636.
- formation of Berlin blue and ferric hydroxide by the action of sunlight on aqueous solutions of potassium ferri-cyanide, A., i, 677.
- action of carbon dioxide on aqueous solutions of ferro- and ferri-cyanides, A., i, 677.
- Maurel, E.**, influence of nitrogenous food on the excretion of uric acid, A., ii, 565.
- influence of diet on the phosphoric acid and sodium chloride of the urine, A., ii, 565.
- Mavrogiannis**, preparation of the esters of *o*-, *m*-, and *p*-nitrobenzoylcyanoacetic acid and crystallised *o*-nitrobenzoic chloride, A., i, 470.
- Mayer, Adolf**, chlorine requirement of buckwheat, A., ii, 416.
- conditions of the production of proteids in plants, A., ii, 526.
- Mayer, Paul**, behaviour of *d*-gluconic acid in the organism, A., ii, 261.
- a new reducing substance in the blood, A., ii, 563.
- Mayer, Richard**. See **Johannes Pinnow**.
- Mazé, Pierre**, rôle of oxygen in germination, A., ii, 32.
- Mazzara, Girolamo**, action of sulphuryl chloride on methyl protocatechuate; dichloroprotocatechuic acid and dichloroveratric acid, A., i, 720.
- Mazzara, Girolamo**, and **P. Guarnieri**, action of sulphuryl chloride on ethyl gallate, A., i, 594.
- action of sulphuryl chloride on the methyl and ethyl esters of gallic acid, A., i, 722.
- Mazzotto, Domenico**, specific heats of alloys, A., ii, 492.
- Mazzucchelli, Arrigo**, conversion of hysocyanine into atropine by means of sodium alkyl oxides in alcoholic solution, A., i, 161.
- Mead, L. D.**, and **William J. Gies**, physiological and toxicological effects of tellurium compounds, A., ii, 261.
- Meade, Richard K.**, method for preparing normal, seminormal, decinormal, &c., sulphuric acid of exact strength, A., ii, 342.
- preparation of strictly tenth-normal, fifth-normal, &c., hydrochloric or nitric acid, A., ii, 530.
- Means, Thomas H.** See **Milton Whitney**.
- Megele, L.** See **Hans Buchner**.
- Mehl, Hugo F.** See **Louis Kahlenberg**.
- Mehner, Hans**, *o*- and *p*-chlorophenylacetic acids, A., i, 208.
- derivatives of anthranilic acid, A., i, 470.
- esters of anthranilic acid, A., i, 644.
- Meigen, Wilhelm**, simple reaction for distinguishing aragonite and calcite, A., ii, 692.
- Meillère, G.**, presence of sucrose in Panama wood, A., ii, 185.

- Meillère, G.**, and *Ph. Chapelle*, estimation of reducing sugars in blood, A., ii, 354.
- Meillère, G.**, and *Lœper*, glycogen in animal organs, A., ii, 326.
- Meisenheimer, Jacob**, nitroanthracene, A., i, 135.
- Meissl, Emerich**, and *Wilhelm Bersch*, metabolism in the pig during feeding with sugar, starch, and molasses, A., ii, 668.
- Meissner, Richard**, occurrence and disappearance of glycogen in yeast cells, A., ii, 263.
- Meister, Lucius & Brüning**. See *Farbwerke vorm. Meister, Lucius, & Brüning*.
- Meldola, Raphael**, and *John Vargass Eyre*, additional notes on dinitro-*o*-anisidine; a chemical reaction in which one of the products continues the same reaction, T., 1076; P., 1901, 131, 185.
- Meldola, Raphael**, and *Frederick William Streetfeild*, note on Gallinek's aminomethylnaphthimazole, P., 1900, 183.
- Meldola, Raphael**, and *Elkan Wechsler*, the nitration of acetamino-*o*-phenyl acetate (diacetyl-*o*-aminophenol): a correction, P., 1900, 180.
- Meldrum, Andrew N.** See *Francis Robert Japp*.
- Mellor, J. W.**, some α -alkyl substitution products of glutaric, adipic and pimelic acids, T., 126; P., 1900, 215.
- on the union of hydrogen and chlorine. Parts I. to III., T., 216; P., 1900, 221.
- estimation of cyanides and cyanates, A., ii, 202.
- Mendel, Lafayette B.**, and *Edward C. Schneider*, excretion of kynurenic acid, A., ii, 259, 565.
- Mendel, Lafayette B.**, and *F. P. Underhill*, products of papain and bromelin proteolysis, A., i, 355.
- Mendel, Lafayette B.** See also *P. A. Levene*.
- Menin, Alfredo**. See *G. Pellini*.
- Mennicke, H.**, analysis of bone fat, A., ii, 138.
- Mensio, Carlo**. See *Isilio Guareschi*.
- Merck, [Carl] Emanuel**, compounds of the alkali metals and cyclic amino-ketones, A., i, 670.
- Merklin, Prosper**. See *P. Nobécourt*.
- Merriam, Henry F.** See *Henry Lord Wheeler*.
- Merrill, L. H.**, box experiments with phosphoric acid from different sources, A., ii, 341.
- Merzbacher, Aaron**, and *Edgar Francis Smith*, electrolytic oxidation of toluene, A., i, 134.
- Meschlumljanz, P.** See *Carl Adam Bischoff*.
- Mesnil, Félix**, intracellular digestion and enzymes in Actiniac, A., ii, 562.
- Metelka, Milan**. See *Hans Jahn*.
- Methner, Theodor**, the citric acid solubility of the phosphoric acid contained in bone meal, A., ii, 278.
- Metzger, F. J.** See *Horace Lemuel Wells*.
- Metzger, Richard**. See *Otto Dimroth*.
- Meunier, Jean**, molecular compound of methyl iodide with methyl alcohol, A., i, 442.
- Lindet's process for the estimation of dextrose and dextrin in commercial glucose, A., ii, 286.
- Meunier, Léon**, estimation of rennet-ferment in gastric juice, A., ii, 115.
- estimation of hydrochloric acid in gastric juice, A., ii, 342.
- Meunier, Stanislas**, meteorite from Lançon, France, A., ii, 66.
- meteorite from Ceylon, A., ii, 322.
- the red rain at Palermo in March, 1901, A., ii, 322.
- Meusel, W.** See *Daniel Vorländer*.
- Meusser, A.**, cobalt and nickel iodates and their solubility in water, A., ii, 555.
- Meusser, Adolf**. See *Otto Ruff*.
- Meyer, D.**, calcium compounds in soils; estimation of assimilable calcium, A., ii, 273.
- Meyer, Ernst von**, [with *R. Nacke*, and *M. Gmeiner*], *p*-toluenesulphonic acid, A., i, 264.
- Meyer, Ferdinand C.** See *Robert Behrend*.
- Meyer, Hans**, amino-acids, A., i, 190.
- nitrogen derivatives of cantharidin, A., i, 221.
- acid chlorides of the pyridine series, A., i, 407.
- general method for preparing chlorides of organic acids, A., i, 628.
- ester-formation with pyridinepolycarboxylic acids, A., i, 750.
- Meyer, Richard Jos.**, and *Richard Jacoby*, double nitrates of quadrivalent cerium and of thorium, A., ii, 510.
- Meyer, Richard Jos.**, and *E. Marekwald*, separation of cerite earths from monazite sand, A., ii, 21.
- Meyerhoffer, Wilhelm**, reciprocal salt pairs. III. Melting points of reciprocal salt pairs; the preparation for analysis and the synthesis of minerals by double decomposition, A., ii, 639.

- Meyerhoffer, Wilhelm**, and **F. G. Cottrell**, an acid triple salt, A., ii, 552.
- Meyerhoffer, Wilhelm**. See also **Jacobus Henricus van't Hoff**.
- Michael, Arthur**, syntheses with ethyl sodioacetoacetate and the formation of rings of four carbon atoms by means of sodium ethoxide, A., i, 123.
- methyl cyanide as a catalytic reagent; and a criticism of J. U. Nef's views on the Frankland, Wurtz, and Conrad reactions, A., i, 457.
- Michael, Arthur**, and **Wallace T. Conn**, action of iodine and bromine on chlorine heptoxide and perchloric acid, A., ii, 152.
- Michael, Arthur**, [with **Robert Nelson Hartman**], study of the Perkin reaction, A., i, 358.
- Michael, Arthur**, [and, in part, **Virgil L. Leighton**, and **F. D. Wilson**], isomeric isobutylene chlorohydrins and the decomposition of mixed ethers by hydrogen haloids, A., i, 625.
- Michaelis, [Carl Arnold] August**, remarks on the relation of inorganic to organic chemistry, A., i, 195.
- Michaelis, August**, and **K. von Arend**, action of phosphorus oxychloride on ethyl aminocrotonate, A., i, 609.
- phosphorus suboxide, A., ii, 153.
- Michaelis, August**, and **H. Bindewald**, thiopyrine, A., i, 52.
- Michaelis, August**, [with **A. Buss**, **Hugo Ciani**, **L. Eifer**, **Paul Güsewell**, **M. Heine**, **H. Hess**, **C. Hosseus**, **D. von Karchowski**, **W. Krahe**, **Paul Loebner**, **Felix Ohm**, **Alfred Schaeuble**, **Paul Schönherr**, **Wilhelm Söchtig**], aromatic chlorophosphines and their derivatives, A., i, 300.
- Michaelis, August**, and **A. Flemming**, dibenzylmethane- and hydroxymethylencamphor-phosphinic acids, A., i, 438.
- Michaelis, August**, and **E. Gunkel**, action of aniline and of ammonia on 5-chloro-1-phenyl-3-methylpyrazole methochloride, A., i, 351.
- Michaelis, August**, [with **F. Hillringhaus**, **E. Richter**, and **G. Thovénnot**], aromatic boron compounds, A., i, 355.
- Michaelis, August**, **U. Voss**, and **Max Greiss**, some 5-halogenphenylalkylpyrazoles, A., i, 407.
- Michaelis, Leonor**, dyes for fats, A., i, 489.
- Micheli, F. Jules**, electromotive force and optical constants of chromium, A., ii, 82.
- Michie, Arthur C.** See **Francis Robert Japp**.
- Miers, Henry Alexander**, Rammelsberg memorial lecture, T., 1; P., 1900, 219.
- Miklaszewski, Bol.**, and **Stefan von Niementowski**, the three isomeric β -aminophenylbenzimidazoles, A., i, 760.
- Miller, Wilhelm von**, and **Georg Rohde**, [in part with **Josef Brunner** and **Ernst Fussenegger**], the cinchona alkaloids, A., i, 95.
- Miller, William Lash**, and **Frank B. Kenrick**, model to show ionic migration, A., ii, 55.
- Millosevich, Federico**, perovskite from Emarese in Val d'Aosta, A., ii, 398.
- Mills, W. Sloan**. See **Hugh Ryan**.
- Milroy, J. A.**, action of reducing agents on hæmatin, A., i, 656.
- an albumose in urine, A., ii, 68.
- Milroy, T. H.**, acid poisoning in birds, A., ii, 611.
- Minguin, Jules**, and **E. Grégoire de Bollemont**, racemisation, A., ii, 497.
- Minguin, Jules**. See also **Albin Haller**.
- Miolati, Arturo**, constitution of nitroferricyanides, A., i, 131.
- Miolati, Arturo**, and **I. Bellucci**, platinum compounds, A., ii, 246.
- Miolati, Arturo**, and **E. Mascetti**, inorganic acids, A., ii, 381.
- Miolati, Arturo**, and **C. C. Tagiuri**, some ruthenium compounds, A., ii, 246.
- Miranda, M.** See **V. Delfino**.
- Misslin, Emile**. See **Friedrich Kehrman**.
- Mitchell, Charles Ainsworth**, the Mau-mené test for oils, A., ii, 587.
- Mitt, F.** See **Carl Adam Bischoff**.
- Mochizuki, Junichi**, decomposition of proteids by trypsin, A., ii, 667.
- Modzelewski, Jean de**. See **J. de Kowalski**.
- Möbius, M.**, anthopacin, the brown colouring matter of flowers, A., i, 221.
- Möhlau, Richard**, and **Max Heinze**, characterisation of aminoazo-compounds, A., i, 432.
- Möhlau, Richard**, and **Ernst Kegel**, condensation of benzhydrols with p -hydroxyazo-compounds and the structure of the latter, A., i, 56.
- Möller, Johann**, electrolytic reduction of o -nitroanthraquinone to o -aminoanthraquinone, A., i, 598.
- electrolytic reduction of o -nitroanthraquinone in alkaline, and of 1:5- and α -dinitroanthraquinone in acid solution, A., i, 646.

- Moeser, Ludwig.** See *Wilhelm Eidmann*.
- Mohr, Otto,** synthesis of the $\alpha\alpha'$ -dimethyladipic acids, A., i, 364.
- Mohr, Otto.** See also *Johannes Wislicenus*.
- Moir, James,** *o*- and *p*-cyanohydroxyderivatives of pyridine, P., 1901, 69.
- Moissan, Henri,** samarium carbide, A., ii, 61.
- preparation and properties of sulphammonium, A., ii, 234.
- new treatment of niobite: preparation and properties of fused niobium, A., ii, 556.
- Moissan, Henri,** and *Paul Lebeau*, sulphuryl fluoride; a new gas, A., ii, 233.
- Moitessier, Joseph.** See *Jules Ville*.
- Molinié, Mareel,** waters contaminated by cystine, A., ii, 42.
- Molinier, M.** See *Albert Frouin*.
- Molisch, Hans,** new chromogen producing a carmine-red dye, A., ii, 571.
- Moltke-Hansen, Ivar,** electrolytic separation of lead from manganese, A., ii, 478.
- Momsen, C.** See *Eberhard Ramm*.
- Monheim, J.** See *Julius Brecht*.
- Montanari, Carlo,** estimation of potassium by perchloric acid in commercial analyses, A., ii, 195.
- organic iodine in the waters of Salsomaggiore, A., ii, 664.
- rapid estimation of nitrate in soils, A., ii, 688.
- Montemartini, Clemente,** compounds of bismuth salts with organic bases, A., i, 163.
- Montemartini, Clemente,** and *U. Egidi*, bismuth phosphates, A., ii, 62.
- soluble bismuth phosphate, A., ii, 106.
- studies of the acids of phosphorus. I. Velocity of hydration of metaphosphoric acid, A., ii, 551.
- Monti, C.** See *Attilio Purgotti*.
- Moody, Herbert R.** See *Samuel Auchmuty Tucker*.
- Moore, Anne,** poisonous effects of saline solutions, A., ii, 68.
- effect of ions on the contraction of the lymph hearts of the frog, A., ii, 257.
- Moore, Benjamin,** and *William H. Parker*, the functions of bile as a solvent, A., ii, 402.
- Moore, Benjamin,** and *C. O. Purinton*, complete removal of the suprarenal glands, A., ii, 406.
- Moreau, B.,** properties and estimation of alkali persulphates, A., ii, 575.
- Moreschini, R.,** solidification point of fatty acids, A., ii, 48.
- Morgan, Gilbert Thomas,** reduction of ferric salts, A., ii, 694.
- Morgan, Leonard P.,** and *Edgar Francis Smith*, chalcocopyrite, A., ii, 319.
- Morkowin, N.,** influence of anesthetics on the respiration of plants, A., ii, 331.
- Morpurgo, Giulio,** determination of the hardness of water, A., ii, 133.
- Morris, George Harris,** the combined action of diastase and yeast on starch-granules, T., 1085; P., 1901, 178.
- Morris, George Harris.** See also *Allan Macfadyen*.
- Morse, Harmon Northrup,** and *D. W. Horn*, preparation of osmotic membranes by electrolysis, A., ii, 543.
- Moschner, J.,** 4-hydroxyhydrindene; new derivatives of xylene and ethylbenzene, A., i, 374.
- Moser, haemoglobin crystals** for the distinction between human and animal blood, A., ii, 712.
- Mosler, Hugo,** temperature coefficient of the susceptibility of some salt solutions of the iron group, particularly of ferric chloride, A., ii, 643.
- Mossler, Gustav.** See *Ernst Friedjung*.
- Motschan.** See *Theodor T. Seliwanoff*.
- Mott, Frederick W.,** and *William Dobinson Halliburton*, chemistry of nerve degeneration, A., ii, 463.
- Mott, Frederick W.** See also *William Dobinson Halliburton*.
- Mouneyrat, Antoine,** hexyl bromide, A., ii, 441.
- Moureu, Charles,** new reactions of organometallic compounds of magnesium, A., i, 317.
- Moureu, Charles,** and *Raymond Delange*, acetylenanthlylidene and benzoyl-cenanthlylidene [acetyl and benzoyl-heptinene] and their conversion by hydration into β -diketones, A., i, 14.
- decomposition of ketones of acetylenic function by means of alkalis, A., i, 14.
- acetylenic ketones; synthesis of β -diketones, A., i, 352.
- two new acids of the acetylene series; synthesis of octoic and pelargonic acids, A., i, 359.
- hydrogenation of amylpropionic acid; hexoylacetic acid, A., i, 360.
- syntheses of aldehydes of the acetylene series, A., i, 381.
- Moureu, Charles,** and *H. Desmots*, condensation of the true acetylene hydrocarbons with formaldehyde; synthesis of primary alcohols of the acetylene series, A., i, 442.

- Moussu.** See *Albert Charrin*.
Mouton, H., intracellular diastases of the *Amoeba*, A., i, 623.
Muck, O., thiocyanates in nasal and conjunctival secretion, A., ii, 117.
Mühle, Karl. See *Gustav Loges*.
Mühle, Paul, preparation of pure amphotone, A., i, 492.
Müller, Aug. See *Carl Haeussermann*.
Müller, C. See *Theodor Curtius*.
Müller, Erich (Berlin), cellulose digestion in the alimentary canal, A., ii, 252.
Müller, Erich (Dresden), diminution of cathodic depolarisation by potassium chromate, A., ii, 218.
 — studies on cathodic polarisation and depolarisation, A., ii, 219.
 — electrolytic preparation of alkali periodates, A., ii, 380.
 — the chlorine-hydrogen gas cell, A., ii, 537.
Müller, Franz, action of iron in anaemia experimentally produced, A., ii, 522.
Müller, Franz. See also *A. Loewy*.
Müller, H. See *Friedrich Kehrmann*.
Müller, Helmut. See *Max Scholtz*.
Müller, Jens. See *Eugen Bamberger*.
Müller, P. See *Th. Fischer*.
Müller, Wilhelm, crystalline form of calcium, barium, and strontium sulphides, A., ii, 60.
Müller, Wilhelm. See also *Alexander Naumann*.
Müller-Thurgau, Hermann, investigations on the roots of plants, A., ii, 525.
Müntz, Achille, and *E. Rousseaux*, agricultural value of Madagascar soils, A., ii, 273.
Muller, Joseph Auguste, composition of a sulphated calcareous water at Lautaret (Hautes-Alpes), A., ii, 114.
Muller, Paul Thiebaut, variation in the composition of natural mineral waters detected by the aid of the electrical conductivity, A., ii, 456.
Mulliken, S. P., J. W. Brown, and *P. R. French*, formaldehyde as a product of the incomplete combustion of carbon compounds, A., i, 188.
Mulliken, S. P., and *Heyward Scudder*, detection of methyl alcohol in mixtures, A., ii, 43.
Mumme, Erich. See *Daniel Vorländer*.
Munk, Immanuel, fat absorption, A., ii, 176.
Munson, L. S. See *L. M. Tolman*.
Murach, F. See *Carl Arnold*.
Murco, H. See *A. Astruc*.
Murray, J. Alan, analysis of soils, A., ii, 350.
Murumow, J. J., J. Sack, and *Bernhard Tollens*, oxycellulose and hydrocellulose, A., i, 453.
Musculus, A. See *W. Feuerstein*.
Myers, H. C., sugar beet in alkali soil, A., ii, 468.
Mylius, Franz, studies on the solubilities of salts. VI. Telluric acid and allotelluric acid, A., ii, 550.
Mylius, Franz, and *Rudolf Dietz*, uranyl chloride and water, A., ii, 660.
Mylius, Franz. See also *Rudolf Dietz*.

N.

- Nabl, Arnold**, action of hydrogen peroxide on thiosulphates, A., ii, 16, 94.
Nacke, R. See *Ernst von Meyer*.
Name, R. G. van, thiocyanates of copper and silver in gravimetric analysis, A., ii, 130.
Namias, Rodolfo, persulphates, A., ii, 15.
Nasse, Otto, use of Millon's reagent, A., ii, 289.
Nastukoff, A., oxycelluloses, A., i, 315.
Natterer, Konrad, chemical investigations in the Red Sea, A., ii, 173.
Naumann, Alexander, and *Wilhelm Müller*, regularities in the distillation of dilute aqueous phenol solutions, A., i, 204.
Nauss, A. O., estimation of Prussian blue in spent gas purifying material, A., ii, 43.
Naylor, William Arthur Harrison, and *Charles Stanley Dyer*, oroxylin, T., 954; P., 1901, 148.
 — estimation of solution of hydrogen peroxide, A., ii, 686.
Neander, Erwin von. See *Conrad Willgerodt*.
Nedokuchaeff, N. K., composition of rye grain at different stages of ripeness, A., ii, 331.
Nef, John Utric, dissociation of the alkyl nitrates, sulphates, and haloids, A., i, 626.
Neff, Paul, estimation of unsaponifiable matters in commercial oleins, A., ii, 360.
Nencki, Marcellus, [methylmercaptan from albumin], A., i, 242.
Nencki, Marcellus, and *Leon Marchlewski*, chlorophyll; degradation of phyllocyanin to hemopyrrole, A., i, 554.
Nencki, Marcellus, and *Natalie Sieber*, nature of pepsin, A., ii, 401.
Nencki, Marcellus, and *J. Zaleski*, reduction products and constitution of hæmin, A., i, 434.

- Nencki, Marcellus**, and **J. Zaleski**, estimation of ammonia in animal liquids and tissues, A., ii, 638.
- Nerking, Joseph**, [properties and composition of glycogen], A., i, 454; ii, 462.
- combination of fat and proteid, A., i, 491.
- solubility of pigments in fats and soaps, A., ii, 117.
- Nernst, Walther**, hydration of dissolved substances, A., ii, 12.
- [E.M.F. of concentration cells], A., ii, 370.
- theory of solutions, A., ii, 647.
- Nestler, Anton**, simple method for the detection of caffeine, and its practical application, A., ii, 432.
- Neubauer, Otto**, combination of glycuronic acid with fatty compounds, A., ii, 614.
- Neuberg, Carl**, glycuronic acid, I., A., i, 66.
- colour reactions of sugars, A., ii, 286.
- detection of succinic acid, A., ii, 290.
- the so-called furfuraldehyde tests for carbohydrates, A., ii, 356.
- Neuberg, Carl**, and **Julius Wohlgemuth**, behaviour of the three arabinoses in the animal body, A., ii, 521.
- Neuberg, Carl**. See also **Ferdinand Blumenthal**, and **Alfred Wohl**.
- Neufeld, C. A.**, apparatus for the extraction of solutions by means of liquids of a lower specific gravity, A., ii, 152.
- Neumann, B.**, calcium carbide and silicon carbide as reducing agents for metallic oxides, salts, and ores, A., ii, 98.
- analysis of commercial metallic silicon, A., ii, 127.
- Neumann, B.**, and **E. Wittich**, natural cadmium oxide, A., ii, 605.
- Neumann, B.** See also **E. Wittich**.
- Neumann, Edgar**. See **Otto Wallach**.
- Neumann, R.** See **Friedrich Krafft**.
- Neville, Allen**. See **Robert Howson Pickard**.
- Neville, Francis Henry**. See **Charles Thomas Heycock**.
- Newth, G. S.**, a laboratory method for the preparation of ethylene, T., 915; P., 1901, 147.
- Nichols, Henry W.**, test for chlorine for use with the blowpipe, A., ii, 342.
- Nicloux, Maurice**, presence of carbon monoxide in the blood, A., ii, 518.
- passage of carbon monoxide from mother to foetus, A., ii, 608.
- Nicola, Francesco**, iron of normal urine, A., ii, 326.
- Niederstadt, B.** See **Alexander Tschirch**.
- Niementowski, Stefan von**. See **Bol. Miklaszewski**.
- Nietzki, Rudolf**, and **Richard Dietschy**, tetranitrobenzene, nitro-dinitroso-benzene, and trinitrophenylhydroxylamine, A., i, 196.
- Nobbe, Friedrich**, and **Lorenz Hiltner**, effect of different amounts of inoculating material on the production of nodules and the yield of Leguminosae, A., ii, 187.
- Nobécourt, P.**, and **Prosper Merklin**, ferment acting on salol in various organs, A., ii, 324.
- Noeldechen, Fritz**, derivatives of cyclopentadiene, A., i, 61.
- Noël-Paton, Diarmid**, metabolism in the dog before and after removal of the spleen, A., ii, 29.
- Noël-Paton, Diarmid**, and **J. Eason**, influence of drugs on hepatic metabolism, A., ii, 253.
- Nöltig, Emilio**, and **H. Blum**, derivatives of diketohydrindene (indanedione), A., i, 728.
- Nöltig, Emilio, A. Braun**, and **G. Thesmar**, nitro- and bromo-derivatives of the xylienes, A., i, 588.
- Nörr, Wilhelm**. See **Roland Scholl**.
- Nola, E. di**. See **Ubaldo Antony**.
- Nolf, Pierre**, osmotic pressure of dog's submaxillary saliva, A., ii, 176.
- mechanism of the action of the [red] blood corpuscles, A., ii, 256.
- Nordenskiöld, Adolf Erik**, discovery and occurrence of minerals containing rare elements, A., ii, 319.
- microlite from Finland, A., ii, 515.
- Nordenskiöld, Ivar**, molybdenum semipentoxide, A., ii, 454.
- Norris, George L.**, estimation of manganese in ferro-manganese and nickel in steel, A., ii, 579.
- Norris, James F.**, non-existence of tervalent carbon, A., i, 198.
- Norris, James F.**, and **Warren W. Sanders**, triphenylchloromethane, A., i, 198.
- Norris, R. S.**, phenyl-*p*-nitro-*o*-tolylsulphone and some of its derivatives, A., i, 134.
- North, Edward**. See **Henry Fay**.
- Norton, John T., jun.**, action of sodium thiosulphate on solutions of metallic salts at high temperatures and pressures, A., ii, 624.
- Nothomb, Marcel**, dissociation of anti-mony pentachloride, A., ii, 88.
- Nowakowski, Leon**. See **Augustin Bis-trzycki**.

- Noyes, Arthur Amos**, exact relation between osmotic pressure and vapour pressure, A., ii, 87.
- modification of the common method of determining transport numbers and investigation of the influence of concentration on these numbers for some ternary salts, A., ii, 143.
- Noyes, Arthur Amos**, and **A. A. Blanchard**, lecture experiments illustrating the electrolytic dissociation theory and the laws of the velocity and equilibrium of chemical change, A., ii, 91.
- Noyes, William Albert**, synthesis of derivatives of dimethyleyclopentanone, $\beta\beta$ -dimethyladipic acid, and $\alpha\beta\beta$ -trimethyladipic acid, A., i, 631.
- Noyes, William Albert**, and **W. M. Blanchard**, camphoric acid. X. Racemic campholytic acid and racemic dihydrohydroxycampholytic acid, A., i, 664.
- Noyes, William Albert**, and **L. Leslie Helmer**, estimation of sulphur in iron and steel, A., ii, 687.
- Noyes, William Albert**, and **Albert C. Lyon**, reaction between chlorine and ammonia, A., ii, 601.
- Noyes, William Albert**, and **R. R. Warfel**, the boiling point curve of mixtures of ethyl alcohol and water, A., ii, 594.
- Nüesch, Paul**. See **Friedrich Kehrmann**.
- Nussberger, Gustav**, thermal water from Vals, Lugnez Valley, A., ii, 322.
- mineral springs of Val Sinestra, Lower Engadine, A., ii, 322.
- Nussberger, Gustav**. See also **Chr. Tarnuzzer**.
- O.**
- Oates, William Henry**. See **George Young**.
- Obermiller, Gustav**. See **Max Busch**.
- Obermiller, Julius**. See **Hans von Pechmann**.
- Obrastzoff, S.** See **D. Iwanowski**.
- O'Byrne, Leo**. See **John Bishop Tingle**.
- Oddo, Giuseppe**, etherification by means of inorganic salts, A., i, 495.
- phosphorus oxychloride as a solvent in cryoscopy, A., ii, 492.
- the two iodine monochlorides, A., ii, 648.
- iodine trichloride, A., ii, 649.
- [sulphur trioxide and its dimeric form], A., ii, 650.
- Oechsner de Coninck, William**, some reactions of substituted anilines, A., i, 80.
- Oechsner de Coninck, William**, uranium nitrate, A., ii, 104, 105, 164, 165.
- uranium nitrate and sulphate, A., ii, 390.
- uranium sulphate, A., ii, 660.
- Oechsner de Coninck, William**, and **Camo**, electrolysis of uranium nitrate, A., ii, 556.
- Oechsner de Coninck, William**, and **Servant**, specific difference between ketones and aldehydes, A., i, 126.
- Oefele**, estimation of fat in faeces, A., ii, 78.
- Oehler, K.**, preparation of hydroxytriazoles and their sulphonic acids, A., i, 768.
- Oesterlin, Carl**. See **Alfred Wohl**.
- Offer**, a new sugar reaction, A., ii, 354.
- Ogawa, Masataka**. See **Edward Divers**.
- Ogden, A. W.** See **Edward H. Jenkins**.
- Ohm, Felix**. See **August Michaelis**.
- Okell, J.** See **Arthur Harden**.
- Oker-Blom, Max**, electromotive phenomena of resting frog's muscle, A., ii, 326.
- absorption and secretion, A., ii, 520.
- an electrometric method to determine the presence of very small quantities of electrolytes whose ions are transported at different speeds, A., ii, 541.
- resorption of one solution by another, A., ii, 543.
- Olds, H. F.**, "blue asbestos" [crocidolite], A., ii, 113.
- Oliveri, Vincenzo**, and **F. Romano**, wheat and vine culture, A., ii, 527.
- Ongaro, G.**, analysis of a zeolite, A., ii, 396.
- Oppenheimer, Sally**. See **Hans Jahn**.
- Oppermann, E.** See **Charles Cornfield Garrard**.
- Orloff, N. A.**, amount of selenium in sulphuric acid, A., ii, 192.
- preparation of arsenic free from antimony, A., ii, 313.
- formation of the green variety of sulphur, A., ii, 499.
- new mode of formation of Wöhler's blue (or green) sulphur, A., ii, 499.
- Orndorff, William Ridgely**, and **C. E. Brewer**, constitution of gallein and cerulein, A., i, 724.
- Orndorff, William Ridgely**, and **J. E. Teeple**, bilirubin, the red colouring matter of the bile, A., i, 602.
- Orndorff, William Ridgely**, and **E. D. Thebaud**, two modifications of benzene-4-azoresorcinol and the constitution of the hydroxyazo-compounds, A., i, 774.
- Orth, W.** See **Stanislaus von Kostanecki**.
- Ortloff, Hugo**, influence of carbon dioxide on fermentation [of sucrose], A., ii, 262.

- Orton, Kennedy Joseph Previte**, benzoxylation of fatty acids in the presence of ammonia; formation of amides, T., 1351; P., 1901, 200.
- Orton, Kennedy Joseph Previte**, and **Archibald Edward Garrod**, benzoxylation of alcapton urine, A., ii, 614.
- Orton, Kennedy Joseph Previte**. See also **Frederick Daniel Chattaway**.
- Ōsaka, Yukichi**, birotation of dextrose, A., i, 127.
- relation between the dissociation constant and the degree of dissociation of an electrolyte in the presence of other electrolytes, A., ii, 371.
- Osborne, Thomas Burr**, a hydrolytic product from edestin, its relationship to Weyl's albuminate and to the histone group, A., i, 781.
- the basic nature of the proteid molecule and the behaviour of edestin to known quantities of acid and alkali, A., i, 781.
- a type of reaction by which sodium carbonate and hydrochloric acid may be formed in the animal organism, A., ii, 402.
- Osborne, W. A.**, ether and chloroform extraction apparatus for liquids, A., ii, 136.
- *rigor mortis* and the formation of *d*-lactic acid, A., ii, 460.
- Oshima, Kintaro**, and **Bernhard Tollens**, nori from Japan, A., ii, 468.
- spectral reactions of methylfurfuraldehyde, A., ii, 484.
- Ost, Hermann**, distribution of sulphuric acid in the atmosphere, A., ii, 15.
- Ost, Hermann**, and **W. Klapproth**, precipitation of tin from its sulpho-salts and its separation from antimony by electrolysis, A., ii, 695.
- Ostwald, Wilhelm**, absolute potentials of the metals and remarks on normal electrodes, A., ii, 2.
- periodic phenomena in the dissolution of chromium in acids, A., ii, 24.
- Ostwald, Wilhelm**. See also **N. T. M. Wilsmore**.
- O'Sullivan, Cornelius**, gum tragacanth, T., 1164; P., 1901, 156.
- Oswald, Ad.**, thyreo-globulin, A., ii, 461.
- Oswald, Ad.** See also **E. von Cyon**.
- Ott, Emil**. See **Friedrich Kehrmann**.
- Otto, Marius**, determination of the molecular weight of ozone by means of the balance, A., ii, 380.
- Otto, Richard**, chemical changes in apples during ripening, A., ii, 678.
- Ouvrard, Léon [Victor René]**, borates of magnesium and the alkali-earth metals, A., ii, 158.
- P.**
- Paal, Carl**, albumin peptones, A., i, 623.
- action of aminosulphonic acid on *p*-chloroaniline, A., i, 693.
- Paal, Carl**, and **M. Hubaleck**, action of aminosulphonic acid on piperidine, A., i, 745.
- Paal, Carl**, and **Heinrich Schulze**, dibenzoylmalic and dibenzoylfumaric esters, A., i, 148.
- the stereoisomeric symmetrical dibenzoylthylenes, A., i, 154.
- Paal, Carl**, and **Hermann Stern**, isomeric bromodiphenaclys, A., i, 476.
- Pagel, Camille**, calcium glycearoarsenate, A., i, 498.
- destruction of organic substances by means of chromyl chloride in toxicological analysis, A., ii, 39.
- Pagliani, Stefano**, specific volume of liquids at infinite pressure, A., ii, 644.
- Pagnoul, Aimé**, cultivation of barley, A., ii, 123.
- estimation of clay in soil, A., ii, 283.
- Pakes, Walter Charles Cross**, and **Walter Henry Jollyman**, the collection and examination of the gases produced by Bacteria from certain media, T., 322; P., 1900, 189.
- the bacterial decomposition of formic acid into carbon dioxide and hydrogen, T., 386; P., 1901, 29.
- the bacterial oxidation of formates by nitrates, T., 459; P., 1901, 39.
- Palache, Charles**, tellurides from Colorado, A., ii, 109.
- Paliatseas, Photios G.** See **James Johnstone Dobbie**.
- Palladin, Wladimir**, synthesis of proteids, A., ii, 333.
- Palladini, M.**, estimation of tartaric acid in presence of oxalic acid, A., ii, 135.
- Palmaer, Wilhelm**, capillary-electrical phenomena, A., ii, 370.
- Panaotovic**. See **Conrad von Seelhorst**.
- Panzer, Theodor**, a chlorinated casein and its decomposition products with fuming hydrochloric acid, A., i, 780.
- Panzer, Theodor**. See also **Ernst Ludwig Paoletti**. See **Guido Pellizzari**.
- Paolini, Vincenzo**, resolution of trimethylsuccinic acid into its optical antipodes, A., i, 253.
- a new trimethylenedicarboxylic acid, A., i, 253.
- Papež, A. N.** estimation of phosphoric acid in basic slags, A., ii, 192.
- Pappos**. See **Carl D. Harries**.

- Paradies, Th.** See *Martin Freund*.
- Paris, Giulio**, the sensitiveness and trustworthiness of certain methods of detecting citric and tartaric acids, and of one of these in presence of the other, A., ii, 206.
- Parker, William H.** See *Benjamin Moore*.
- Parkin, John**, a reserve carbohydrate, which produces mannose, from the bulb of *Lilium*, A., ii, 414.
- Parmentier, F.**, alumina present in mineral waters, A., ii, 516.
- Parsons, Charles Luthorp**, use of metallic sodium in blow-pipe analysis, A., ii, 423.
- Parsons, J. Herbert**, action of nicotine on nerve-cells, A., ii, 408.
- Pasdermadjian, G.** See *Fritz Ullmann*.
- Pasea, Charles M.**, relative bulk of weak aqueous solutions of certain sulphates and their constituent water, A., ii, 227.
- Passon, Max**, estimation of calcium by the citrate method, A., ii, 317.
- Patein, Gustave**, estimation of sugar in certain urines, A., ii, 355.
- Patein, Gustave**, and **Poyou**, analysis of pus from a tumour in the kidney, A., ii, 566.
- Patterson, Thomas S.**, the influence of solvents on the rotation of optically active compounds. Part I. Influence of water, methyl alcohol, ethyl alcohol, *n*-propyl alcohol, and glycerol on the rotation of ethyl tartrate, T., 167; P., 1900, 176.
- the influence of solvents on the rotation of optically active compounds. Part II. Influence of isobutyl alcohol and of *sec*-octyl alcohol (methylhexylcarbinol) on ethyl tartrate, T., 477; P., 1901, 40.
- Patterson, Thomas S.**, and **Cyril Dickinson**, the preparation of esters from other esters of the same acid, T., 280; P., 1901, 4.
- Patton, Horace B.**, thomsonite and mesolite from Golden, Colorado, A., ii, 455.
- Paturel, G.**, sulphurous acid in wines, A., ii, 628.
- Paul, L.** See *Stanislaus von Kostanecki*.
- Paul, Theodor**, theobromine and caffeine and the salts they form, A., i, 341.
- Paul, Theodor**. See also *Wilhelm His, jun.*
- Pauli, H.** See *Theodor Curtius*.
- Pauly, Hermann**, bromo-derivatives of diethyl ketone, A., i, 505.
- Pauly, Hermann**, and **Hans von Berg**, conversion of $\alpha\beta$ -unsaturated diketones into α -diketones, A., i, 506.
- Pauly, Hermann**, and **Carl Boehm**, 3-keto-2:2:5:5-tetramethylpyrrolidine, A., i, 607.
- Pauly, Hermann**, and **A. Schaum**, aminopyrrolidines, A., i, 607.
- Pavliček, F.** See *Bohuslav Brauner*.
- Pavy, Frederick William**, and **R. L. Siau**, nature of the sugar present in blood, urine, and muscle, A., ii, 257.
- Pawlewski, Bronislaw**, formation of canarin, A., i, 71.
- change of temperature attending the solidification of melted organic substances, A., ii, 85.
- Pawloff, Wladimir**, double compounds of mercuric and potassium iodides, A., ii, 101.
- Peachey, Stanley John**. See *William Jackson Pope*.
- Peano, Edoardo**, derivatives of diethyl ketone, A., i, 346.
- Peano, Edoardo**. See also *Isilio Guareschi*.
- Pearce, Francis**. See *Louis Duparc*.
- Péchar, E.**, reduction of molybdosulphuric acid by alcohol, A., ii, 243.
- Pechmann, Hans von**, dicrotonic acid, A., i, 63.
- Pechmann, Hans von**, and **Emil Burkard**, stereoisomerism of the two crotonic acids; 4-methylpyrazole-5-carboxylic acid, A., i, 167.
- pyrazole derivatives from diazomethane and olefinemonocarboxylic acids, A., i, 167.
- combination of diazomethane with citraconic and mesaconic acids, A., i, 163.
- Pechmann, Hans von**, and **Erdmann Graeger**, 7-hydroxycoumarin-4-carboxylic acid, A., i, 286.
- Pechmann, Hans von**, and **Erwin Hanke**, coumarins from phenols and negatively-substituted alkyl acetates: study of coumarins, A., i, 210.
- Pechmann, Hans von**, [with **Max Hauser**], isocoumalic acid, A., i, 480.
- Pechmann, Hans von**, and **E. von Krafft**, coumarins from phenol, A., i, 285.
- coumarins from 1:2:4-trihydroxybenzene, A., i, 286.
- Pechmann, Hans von**, and **Julius Obermiller**, derivatives of 4-methylumbelliferone, A., i, 336.
- Pechmann, Hans von**, and **Otto Röhm**, polymerisation of unsaturated acids. III. α -Methyleneglutaric acid, a product of the polymerisation of acrylic acid, A., i, 253.
- Peckham, Stephen Farnum**. See *Otto H. Klein*.

- Peeters, Edgar**, isopropanolamine [β -aminoisopropyl alcohol], A., i, 259.
- Pekelharing, Cornelis A.**, and **W. Huiskamp**, proteids of the thymus gland, A., i, 175.
- Pélabon, Henri**, action of hydrogen on bismuth monosulphide, A., ii, 165.
- action of hydrogen on realgar and the inverse reaction; influence of pressure and temperature, A., ii, 313.
- experimental verification of a law of chemical mechanics, A., ii, 545.
- action of hydrogen on mercury sulphide, A., ii, 656.
- Pellat, Henri**, measurement of the rotatory power of sugar, its variation with temperature and with the wavelength of the light used, A., i, 672.
- Pellet, Henri**, estimation of nitrites alone or in the presence of nitrates, A., ii, 73.
- estimation of air in water, A., ii, 75.
- source of error in testing wine for salicylic acid, A., ii, 207.
- estimation of calcium, magnesium, and phosphoric acid in the presence of a notable proportion of iron oxide, A., ii, 477.
- bleaching of magnesium pyrophosphate by conversion into magnesium pyrosulphophosphate, A., ii, 532.
- estimation of phosphoric acid as ammonium phosphomolybdate, A., ii, 575.
- estimation of sulphur in coal, bitumen, pyrites, roasted ores, products of scorification, &c., A., ii, 622.
- detection and estimation of small quantities of salicylic acid in wines and foods, A., ii, 701.
- nature of the substance giving the ferric chloride reaction; presence of salicylic acid in pure wines, A., ii, 701.
- Pellini, G.**, refractive power of the hydro-derivatives of cyclic chains, A., ii, 365.
- Pellini, G.**, and **Alfredo Menin**, refractive power of tellurium in its compounds, A., ii, 94.
- Pellizzari, Guido**, and **Antonio Alciatore**, trisubstituted derivatives of 1:3:4-triazole, A., i, 571.
- Pellizzari, Guido**, and **Matteo Bruzzo**, monosubstituted derivatives of 1:3:4-triazole, A., i, 570.
- Pellizzari, Guido**, and **C. Massa**, [with **Paoletti**], synthesis of 1:3:4-triazole derivatives, A., i, 488.
- Pellizzari, Guido**, and **R. Rickards**, compounds of aminophenylguanidine with aldehydes and ketones, A., i, 769.
- Pellizzari, Guido**, and **Cesare Roncagliolo**, isomeric anilino-guanidines, A., i, 768.
- researches on guanazole, A., i, 772.
- Peltzer, Frz.** See **Alexander Eibner**.
- Pembrey, Marcus Seymour**, respiration and temperature of the marmot, A., ii, 608.
- Penfield, Samuel Lewis**, chemical composition of turquoise, A., ii, 27.
- Peratoner, Alberto**, and **R. Spallino**, the so-called iodoacetylene, A., i, 657.
- Perciabosco, F.** See **Giorgio Errera**.
- Pereira, A. Cardoso**, detection of salicylic acid in wine and beer, A., ii, 428.
- Pergami, A.** See **Massimo Tortelli**.
- Périn, L.**, determination of unburnt and overburnt gypsum in the plaster of Paris from the kilns, A., ii, 129.
- Perkin, Arthur George**, robinin, violaquercitrin, and osyritrin, P., 1901, 87.
- Perkin, Arthur George**, and **J. R. Allison**, rhamnazin and rhamnetin, P., 1900, 181.
- Perkin, Arthur George**, and **E. J. Wilkinson**, the colouring matter of the flowers of *Delphinium Consolida*, P., 1900, 182.
- Perkin, Frederick Mollwo**, simple method for obtaining a saturated aqueous solution of hydrogen sulphide or a constant supply of the gas, A., ii, 447.
- action of potassium and sodium hydroxides on stannous sulphide, A., ii, 479.
- Perkin, William Henry, jun.**, tetramethylenecarbinol, T., 329; P., 1901, 33.
- synthesis of isocamphoronic acid, P., 1900, 214.
- Perkin, William Henry, jun.**, and **Jocelyn Field Thorpe**, [and, in part, **C. Walker**], the synthetical formation of bridged rings. Part I. Some derivatives of dicyclopentane, T., 729; P., 1900, 149; 1901, 110.
- Perkin, William Henry, jun.**, and **J. Yates**, the action of aluminium chloride on camphoric anhydride, T., 1373; P., 1898, 111; 1899, 23; 1900, 18.
- Perkin, William Henry, jun.** See also **Alexander William Gilbody**, **William Trevor Lawrence**, and **Frederick H. Lees**.
- Perman, Edgar Philip**, vapour pressure of aqueous ammonia solution. Part I., T., 718; P. 1901, 46.
- influence of sodium sulphate on the vapour pressure of aqueous ammonia solution, T., 725; P., 1901, 47.
- detection and estimation of nitric acid in combination with the alkali metals, A., ii, 532.

- Permilleux, amyolytic ferment of the liver, A., ii, 325.
- Perrier, *Gustave*, and *Isidore Pouget*, action of aluminium chloride on aliphatic alcohols, A., i, 442.
- Perrin, standardisation of thiosulphate solution, A., ii, 474.
- Perrin, *F.* See *Auguste Lumière*.
- Perrot, *F. Louis*. See *Philippe A. Guye*.
- Péry, *R.* See *Léonce Barthe*.
- Peschges, *W.*, cryoscopic distinction between butter and margarine, A., ii, 630.
- Pesci, *Leone*, constitution of organo-mercury compounds of benzoic acid, A., i, 576.
- *o*-mercuridibenzoic acid, A., i, 624.
- Peška, *Zdeněk*, estimation of formaldehyde, A., ii, 703.
- Pessis, *A.* See *Carl Adam Bischoff*.
- Petchnikoff, *Alexander*, action of sulphuric acid on the trihydroxy-compound obtained by the oxidation of methylterbutylallylcarbinol, A., i, 183.
- Petermann, *Arthur*, peat, A., ii, 36.
- detection of antithermic substances in urine, A., ii, 293.
- detection of acetanilide in urine, A., ii, 485.
- Petermann, *E.* See *Theodor Zincke*.
- Peters, *Charles A.*, volumetric estimation of copper as oxalate, with separation from cadmium, arsenic, tin, and zinc, A., ii, 40.
- estimation of calcium, strontium, and barium as the oxalates, A., ii, 692.
- Peters, *Kurt*. See *Johannes Wislicenus*.
- Petersen, *P. V. F.* See *E. Holm*.
- Petrenko-Kritschenko, *Pavel Iv.*, configuration of fatty compounds, A., i, 1.
- Petrenko-Kritschenko, *Pavel Iv.*, and *E. Eltschaninoff*, α -diketones, A., i, 506.
- Petrenko-Kritschenko, *Pavel Iv.*, and *S. Lordkipanidzé*, cyclic ketones, A., i, 505.
- Pfanhauser, *W.*, electrochemical behaviour of nickel ammonium sulphate, A., ii, 538.
- Pfeiffer, [*Franz Wilhelm*] *Theodor* [*Christian*], and *Otto Lemmermann*, denitrification and the action of farm-yard manure, A., ii, 37.
- employment of pepsin solution for investigating faeces and stable manure, A., ii, 189.
- Pfeiffer, *Hermann*. See *Alfred Einhorn*.
- Pfeiffer, *Paul*, existence of trichlorotri-aquochromium, A., ii, 659.
- Pflüger, *Eduard* [*Friedrich Wilhelm*], absorption of fat, A., ii, 29, 562.
- estimation of glycogen by the Pflüger-Nerking method, A., ii, 135.
- Pflüger, *Eduard* [*Friedrich Wilhelm*], the absorption of artificially coloured fats, A., ii, 403.
- Phelps, *C. S.* See *Wiebur Olin Atwater*.
- Phelps, *Isaac K.*, and *William J. Hale*, dehydromucic acid and certain of its derivatives, A., i, 555.
- Philip, *Max*, detection of oxycellulose, A., ii, 288.
- Philippson, *P.*, the use of reed tubes for dialysis, A., ii, 646.
- Phillips, *François C.*, compounds of methyl sulphide with haloids of metals, A., i, 444.
- estimation of hydrogen in gas mixtures, A., ii, 530.
- Phillips, *Henry Ablett*. See *John Theodore Hewitt*.
- Phillips, *William Battle*, Texas petroleum, A., ii, 662.
- Phipson, *Thomas Lamb*, analysis of red rain deposit, which fell in Victoria, Australia, December 26, 1896, A., ii, 516.
- Phisalix, *C.*, a volatile venom from the skin of *Iulus terrestris*, A., ii, 69.
- Phisalix, *C.* See also *Auguste Béhal*.
- Piccini, *Augusto*, and *L. Marino*, rhodium alums; the separation of rhodium from iridium, A., ii, 392.
- Piccinini, *Antonio*, and *G. Cortese*, reduction of granatoneoxime and of methylgranatouine, A., i, 740.
- Pick, *Ernst P.*, and *Karl Spiro*, anti-coagulating agents, A., ii, 117.
- Pick, *Waldemar*, electrochemical formation of alkali ferrates, A., ii, 554.
- Pick, *Waldemar*. See also *Fritz Haber*.
- Pickard, *Robert Howson*, and *William Carter*, formation of amides from aldehydes, T., 520; P., 1901, 45.
- hydroxyoxamides, T., 841; P., 1901, 123.
- Pickard, *Robert Howson*, and *Allen Neville*, note on pyromucylhydroxamic acid, T., 847; P., 1901, 127.
- Pickel, *James Marion*, automatic filter-washer, A., ii, 685.
- Pictet, *Amé*, and *A. Rotschy*, new alkaloids from tobacco, A., i, 339.
- Pierron, *Paul*, electrolytic oxidation of nitrotoluenes, A., i, 685.
- Piloty, *Oscar*, and *B. Graf. Schwerin*, nitrosoisobutyronitrile and its derivatives, A., i, 516.
- existence of derivatives of quadrivalent nitrogen, I. and II., A., i, 517, 583.
- Pinkus, *Stanislaw N.*, precipitation of proteids by anhydrous sodium sulphate, A., i, 779.

- Pinner, Adolf**, and **Erich Kohlhammer**, pilocarpine, A., i, 340.
- Pinnow, Johannes**, formation of aromatic quaternary ammonium compounds, A., i, 411.
- [method of] avoiding the formation of bases containing chlorine in the reduction of aromatic nitro-compounds with tin and hydrochloric acid, A., i, 485.
- a new method of testing colourless carbon compounds for absorption of light, A., ii, 368.
- photochemical decomposition of hydrogen iodide: a contribution to the knowledge of sensitising action, A., ii, 634.
- Pinnow, Johannes**, [and, in part, **Richard Mayer**], two dinitromethyl-*p*-toluidines, A., i, 138.
- Pissarjewsky, L.**, thermochemistry of the hyperacids of zirconium, cerium, and thorium, A., ii, 56.
- Pitman, J. R.**, analysis of nitric and mixed acids by du Pont's modification of Lunge's nitrometer, A., ii, 192.
- Pitra, J.** See **Julius Stoklasa**.
- Plancher, Giuseppe**, constitution of the bases formed by the action of alkyl iodides on the indoles, A., i, 563.
- Plancher, Giuseppe**, and **E. Soncini**, benzeneazopyrroles, A., i, 432.
- Plato, F.** See **J. Domke**.
- Plattensteiner, Richard**, condensation of isobutaldehyde with crotonaldehyde, A., i, 254.
- Plaussner, Max**, estimation of the hardness of water, A., ii, 425.
- Plotnikoff, (Mme.) A.** See **Michael I. Konowaloff**.
- Plotnikoff, L. S.**, determination of the avidity of phenol by the thermochemical method, A., ii, 229.
- Plotnikoff, Wladimir A.**, compounds of aluminium bromide with bromine and carbon disulphide, A., ii, 316.
- Poda, Heinrich**, apparatus for the simultaneous estimation of fat and water in butter, A., ii, 482.
- Poshl, Alexandre von**, cryoscopic testing of medicines, A., ii, 211.
- Polenske, Eduard**, behaviour of borax on distillation with methyl alcohol, A., ii, 195.
- Pollak, Hugo**, estimation of urea, A., ii, 210.
- Pollak, Isidor.** See **Eduard Lippmann**.
- Pollak, Jacques.** See **Josef Herzig**.
- Pollitz, G.** See **Herman Decker**.
- Polzeniusz, F.** See **Emil Godlewski**.
- Pomeranz, Caesar**, isochavibetol, A., i, 699.
- Pomeranz, Caesar.** See also **Felix Kauffler**.
- Pommerehne, Herbert**, damascenine, a constituent of the seeds of *Nigella damascena*, A., i, 289.
- Pomorski, J. M.**, influence of the [mode of] distribution of manures on their action, A., ii, 123.
- Pond, F. J.**, and **Arthur S. Shoffstall**, action of sodium ethoxide on anisylidene acetophenone dibromide, A., i, 35.
- Poni, Petru**, minerals of Rumania, A., ii, 25.
- Ponsot, A.**, molecular specific heats of dissociable gaseous compounds, A., ii, 84.
- specific heat of a gaseous mixture of compounds in chemical equilibrium, A., ii, 302.
- chemical reactions in dissolved or gaseous systems; vapour tension; Avogadro's hypothesis, A., ii, 542.
- Gay-Lussac's law and the dissociation of gaseous compounds, A., ii, 542.
- vapour tension of solutions; Arrhenius' hypothesis, A., ii, 593.
- Ponzio, Giacomo**, action of nitrogen tetroxide on the benzilmonoximes, A., i, 154.
- oxidation of hydrazoximes, V., A., i, 169.
- symmetrical α -diketones of the aliphatic series, A., i, 452.
- action of nitric acid on secondary alcohols, A., i, 577.
- phenyldinitromethane [ω -dinitrotoluene], A., i, 685.
- Ponzio, Giacomo**, and **P. Rossi**, 1:3-diphenyl-4-methylsotriazole, A., i, 169.
- Pope, Frank Geo.**, and **James Morton Hird**, derivatives of 3-nitrotolyl-4-hydrazine, T., 1141; P., 1901, 186.
- Pope, Thomas Henry.** See **Arthur R. Ling**.
- Pope, William Jackson**, and **Alfred William Harvey**, the inversion of the optically active ac-tetra-hydro- β -naphthylamines prepared by the aid of *d*- and *l*-bromocamphorsulphonic acids, T., 74; P., 1900, 206.
- — optically active nitrogen compounds and their bearing on the valency of nitrogen; *d*- and *l*- α -benzylphenylallylmethylammonium salts, T., 828; P., 1901, 120; discussion, P., 121.
- Pope, William Jackson**, and **Stanley John Peachey**, asymmetric optically active sulphur compounds; *d*-methyl-ethylthetine platinichloride, P., 1900, 163.
- Poppenberg, Otto.** See **Alfred Stock**.

- Poppewell, Jas. M.**, rapid method for the determination of Prussian blue in spent oxide, A., ii, 352.
- Portier, P.**, glycolytic decomposition of sugars, A., ii, 116.
- Portier, P., and Bierry**, influence of food on the secretion of enzymes, A., ii, 666.
- Posner, Theodor**, disulphones. IV. Mercaptols and sulphones from diketones, A., i, 14.
- disulphones. V. Acetophenone and benzophenone disulphones, A., i, 88.
- disulphones. VI. Sulphonal derivatives of unsaturated ketones, A., i, 474.
- Posner, Theodor**, [with *O. Claudius, Alex. Deinhardt, and A. Ebers*], disulphones. VII. Mercaptols and disulphones of the ketonic acids and the sulphur acids obtained from them, A., i, 703.
- Possetto, Giovanni**, detection of sesame oil in chocolate, A., ii, 703.
- Posternak, Swigel**, physical properties of albuminous micelles, A., ii, 231, 544, 648.
- Pottevin, Henri**, tannase; a diastase decomposing gallotannic acid, A., i, 179.
- constitution of gallotannin, A., i, 335.
- Pouchet, G.**, localisation and dissemination of antimony in the animal organism, A., ii, 673.
- Pouget, Isidore**. See *Gustave Perrier*.
- Pouret, Charles**, action of aluminium bromide on chlorinated acyclic hydrocarbons, A., i, 305.
- Power, Frederick Belding**, [manganese citrate], A., i, 667.
- bark of *Robinia Pseudacacia*, A., ii, 679.
- Poyou**. See *Gustave Patein*.
- Pozzi-Escot, M. E.**, detection of acid carbonates in waters, A., ii, 346.
- detection of alkaloids by microchemical methods, A., ii, 432.
- microchemical investigation of alkaloids, A., ii, 485.
- Praetorius, Arthur**. See *Max Bamberger*.
- Prandtl, Wilhelm**, and *Karl A. Hofmann*, platinum-carbon compounds, A., i, 13.
- Prandtl, Wilhelm**. See also *Karl A. Hofmann*.
- Pratt, Joseph Hyde**, chromite from North Carolina, A., ii, 64.
- Praum, A.**, detection of minute traces of albumin in urine, A., ii, 710.
- Prause, Hugo**. See *Rudolph F. Weinland*.
- Precht, J.**, contributions to the theory of photographic development, A., ii, 1.
- Precht, J.**, and *Wilhelm Strecker*, researches on the silver germ action in development, A., ii, 1.
- Preiswerk, Heinrich**, [albite in] green schist from Piedmont, A., ii, 560.
- Prescott, Albert B.**, detection of methyl alcohol in the presence of ethyl alcohol, A., ii, 581.
- Prescott, Albert B.**, and *Harry Mann Gordin*, isolation and estimation of colchicine, A., ii, 51.
- Prey, C.**, synthesis of $\alpha\beta\gamma$ -trihydroxybutyric acid [erythric acid], A., i, 501.
- Prianischnikoff, Dmitri N.**, influence of temperature on the energy of the decomposition of proteid in germination, A., ii, 120.
- Price, Thomas Slater**, the reaction between ethyl alcohol and hydrochloric acid, T., 303; P., 1900, 185.
- Prior, Eugen**, and *Heinrich Schulze*, physics of fermentation, A., ii, 262.
- Prior, George Thurland**. See *Leonard James Spencer*.
- Proelss, Hans**, behaviour of acid aqueous solutions of alkaloids [glucosides, &c.] towards different solvents, A., ii, 706.
- resisting power of alkaloids, glucosides, and bitters to putrefaction, A., ii, 706.
- Pröscher, Fr.**, Ehrlich's dimethylaminobenzaldehyde reaction, A., ii, 260.
- detection of bilirubin by Ehrlich's diazo-reaction, A., ii, 296.
- Prosin, M.** See *Alexander P. Sabanéeff*.
- Protopopoff, D.**, and *Sergius N. Reformatsky*, synthesis and properties of α -isopropyl- β -isobutylhydraerylic acid, A., i, 447.
- Prunier, [L.] Léon [A.]**, analysis of quinine glycerophosphate, A., ii, 51.
- Puauz**, analysis of the thermal waters of Achkel, A., ii, 27.
- Puchner, H.**, estimation of dry matter in soils, A., ii, 479.
- Puckner, William August**, extraction of morphine with immiscible solvents, A., ii, 707.
- Puls, Karl**, electrolytic oxidation of toluene, A., i, 318.
- Purdie, Thomas**, and *William Barbour*, the influence of solvents on the rotatory powers of ethereal dimethoxysuccinates and tartrates, T., 971; P., 1901, 158.
- Purdie, Thomas**, and *James C. Irvine*, optically active dimethoxysuccinic acid and its derivatives, T., 957; P., 1901, 157.
- Purgotti, Attilio**, and *C. Monti*, *m*-nitrobenzyl derivatives, A., i, 21.

- Purinton, *C. O.* See *Benjamin Moore*.
 Purucker, *Georg.* See *Alexander Eibner*.
 Puschl, *Karl*, the specific heat of solutions, A., ii, 224.

Q.

- Quantin, *Henri*, absence of methyl alcohol in rum, A., i, 111.
 — separation and estimation of ammonia and methylamines, A., ii, 361.
 — analysis of commercial cream of tartar, A., ii, 584.
 Quasig, *Reinhold.* See *Albert Ladenburg*.
 Quennessen. See *Émile Leidié*.
 Quinan, *K. B.*, estimation of soluble nitrocellulose in gun-cotton and smokeless powder, A., ii, 480.
 Quincke, *Georg Hermann*, invisible liquid layers and surface tension of liquid precipitates in the case of precipitated membranes, cells, colloids, and jellies, A., ii, 646.
 Quinton, *R.*, osmosis in marine invertebrates, A., ii, 116.
 — [osmotic phenomena of red blood corpuscles], A., ii, 256.

R.

- Rabe, *H.*, analysis of strong and fuming sulphuric acid, A., ii, 473.
 Rabe, *Paul*, explanation of tautomeric phenomena, A., i, 33.
 — isomeric ammonia derivatives of ethyl benzylidenebisacetoacetate; (benzylidenecacetoacetic - β - aminocrotonate or phenylaminoheptenedicarboxylate), A., i, 147.
 Rabe, *Paul*, and *Adolf Billmann*, Hantzsch's synthesis of ethyl dihydrocollidinedicarboxylate, A., i, 164.
 Rabe, *Paul.* See also *Ludwig Knorr*.
 Rabe, *W. O.*, physical isomerism of thallium picrate, A., i, 697.
 Racine, *R.*, amount of volatile fatty acids in Dutch butter, A., ii, 536.
 Racine, *R.* See also *Wilhelm Kirchner*.
 Radcliffe, *L. G.* See *Leon Marchlewski*.
 Radzikowski, *C.*, alcohol as a stimulant of gastric secretion, A., ii, 401.
 Raikow, *P. N.*, new dropping and separating funnels, A., ii, 91.
 Raikow, *P. N.*, and *P. Schtarbanow*, phosphates of aromatic amines and the dependence of their formation and stability on their composition and structure, A., i, 319.

- Raikow, *P. N.*, and *P. Schtarbanow*, new method for identifying renatured spirits, A., ii, 582.
 Raimann, *Emil*, estimation of minute amounts of sugar in urine, A., ii, 582.
 Ramage, *Hugh.* See *Walter Noel Hartley*.
 Ramann, *Emil.* See *Paul Sorauer*.
 Ramberg, *Ludwig*, optically active forms of α -bromopropionic acid, A., i, 63.
 Ramm, *Eberhard*, [feeding experiments with cows], A., ii, 71.
 Ramm, *Eberhard, C. Momsen, and Th. Schumacher*, feeding experiments on cows with palm kernel cake, crushed palm kernels, and linseed, ricinus and earth nut meals, A., ii, 469.
 Rammelsberg, *Karl Friedrich*, memorial lecture on (Miers), T., 1; P., 1900, 219.
 Ramsay, *William*, note on the supposed formation of an oxide of hydrogen higher than the dioxide, T., 1324; P., 1901, 197.
 — refractivity of the inactive gases, A., ii, 141.
 Ramsay, *William*, and *H. S. Hatfield*, preliminary note on hydrides of boron, P., 1901, 152.
 Ramsay, *William*, and *George Rudolf*, the action of heat on ethylsulphuric acid, P., 1900, 177.
 Ramsay, *William*, and *Morris William Travers*, argon and its companions, A., ii, 237.
 Ranke, *Karl Ernst*, nutrition in summer and winter in moderate climates, A., ii, 29.
 Ransom, *Francis*, injection of tetanus toxin and antitoxin into the subarachnoid space, A., ii, 118.
 Ranwez, *Fernand*, detection of cocoanut oil in butter, A., ii, 702.
 Ranzoli, *G.*, quantitative analysis of lithiniferous waters; comparison of the spectroscopic with the more common methods, A., ii, 423.
 Rapp, *Rudolf.* See *Eduard Buchner*.
 Rapoport, *Theodor, I.* Pyrimidines and cyanidines from paranitrobenzamidine. II. Attempt to prepare *o*-nitrobenzminioether, A., i, 567.
 Rassow, *Berthold*, hydrazo-compounds. II. Action of hydrazobenzenes on aldehydes, A., i, 777.
 Rassow, *Berthold*, and *Max Lummerzhelm*, action of benzaldehyde and aliphatic aldehydes on hydrazobenzene, A., i, 177.
 Rassow, *Berthold.* See also *Georg Friebe*.

- Raudnitz, Robert W.**, the paralysing of platinum catalysis by "poisons," A., ii, 496.
- Rây, Prafulla Chandra**, a new series of dimercuriammonium salts. Part I., P., 1901, 96.
- mercurous nitrite, A., ii, 452.
- Rayleigh, John William Strutt [Lord]**, viscosity of gases as affected by temperature, A., ii, 9.
- spectroscopic notes concerning the gases of the atmosphere, A., ii, 141.
- a new manometer, and the law of gas pressure between 1.5 and 0.01 mm. of mercury, A., ii, 542.
- Reach, Félix**, absorption in the small and large intestines, A., ii, 667.
- Reach, Félix**. See also **Johannes Frentzel**.
- Rebuffat, Orazio**, constitution of hydraulic cements, A., ii, 18.
- action of sea-water on pozzuolana mortar, A., ii, 18.
- artificial pozzuolana, A., ii, 18.
- determination of the calorific power of fuels, A., ii, 373.
- calcium sulpho-aluminates and the decomposition of maritime structures made of Portland cement, A., ii, 385.
- Recchi, V.** See **Luigi Francesconi**, and **C. Manuelli**.
- Recoura, Albert**, action of a metallic hydroxide on solutions of salts of other metals; basic salts of two metals, A., ii, 508.
- Redlich, Berthold**. See **Hans Jahn**.
- Reeb, E.** See **Charles Frédéric Schlagdenhauffen**.
- Reed, C. J.**, gas polarisation in lead accumulators, A., ii, 218.
- Reformatsky, Alexandr**, synthesis of aromatic aldehydes, A., i, 327.
- Reformatsky, Sergius N.**, action of sodium on the esters of organic acids, A., i, 447.
- Reformatsky, Sergius N.** See also **A. Astachoff**, **D. Protopopoff**, and **B. Schischkowsky**.
- Reich, R.**, filicitanic acid, A., i, 212.
- Reichard, C.**, quantitative estimation of morphine by reduction with silver nitrate, A., ii, 140.
- volumetric estimation of morphine by means of potassium iodate and arsenious acid in alkaline solution, A., ii, 487.
- detection of potassium by sodium picrate, A., ii, 577.
- the isopurpuric acid reaction for cyanides, A., ii, 581.
- estimation of morphine in opium by means of ammoniacal silver chloride, A., ii, 707.
- Reicher, Lodewyk Theodorus**, amount of volatile fatty acids in Dutch butters, A., ii, 292.
- Reichert, Edward T.**, influence of digestion on animal heat, A., ii, 28.
- Reid, E. Emmet**, hydrolysis of acid amides, A., i, 29.
- Reid, Edward Waymouth**, intestinal absorption of maltose, A., ii, 458.
- transport of fluid by epithelia, A., ii, 460.
- gelatin filters, A., ii, 675.
- Reimer**. See **Haarmann**.
- Reinbach, H.** See **Max Conrad**.
- Reinders, W.** See **Georg Bredig**.
- Reindl, Ludwig**. See **Otto Fischer**.
- Reinke, Johann**, and **E. Braunnüller**, aldehyde in green leaves, A., ii, 332.
- Reissiger, H.** See **Walther Lippert**.
- Reitinger, J.** See **E. H. Kraus**.
- Reitmair, Otto**. See **Franz W. Dafert**.
- Reitter, Hans**, molecular rotation of ethyl *n*-acetyl-malates, A., ii, 214.
- Remsen, Ira**, and **W. W. Garner**, action of aromatic sulphonic chlorides on carbamide, A., i, 270.
- Remsen, Ira**, and **H. J. Turner**, action of aromatic sulphonic chlorides on thiocarbamide, A., i, 270.
- Rémy, Theodor**, manurial experiments with hops, A., ii, 35.
- production of brewing barley with low percentage of nitrogen on light soils, A., ii, 186.
- Rengade, Etienne**. See **Camille Chabrié**.
- Renz, Carl**, indium, A., ii, 657.
- Report of the Commission to the Manchester Brewers' Central Association**, arsenic in beer, A., ii, 125.
- Report of the Principal Chemist of the Government Laboratory and a Committee appointed by the Society of Public Analysts**, the Margarine Clause of the Food and Drugs Act, A., ii, 77.
- Reuter, Baptist**. See **Gustav Ebert**.
- Reverdin, Frédéric**, and **Pierre Crépieux**, action of nitric acid on *o*-nitrotoluene-*p*-sulphonamide; nitration of *p*-toluenesulphonic chloride, A., i, 685.
- derivatives of toluene-*p*-sulphonic chloride and *o*-nitrotoluene-*p*-sulphonic chloride, A., i, 686.
- Reychler, Albert**, examination of butter and fats, A., ii, 208.
- oxides of chlorine, A., ii, 548.
- chlorine peroxide as a steriliser of drinking waters, A., ii, 548.
- Reymenant, Léon van**, methyl ethyl ketone, A., i, 126.
- Reynaud, Georges**. See **Alexandre Hébert**.

- Reynolds, Richard**, obituary notice of, T., 873.
- Rhodes, Herbert**. See *Sir Thomas Lauder Brunton*.
- Rhorer, Ladislaus von**, electrometric determination of the acidity of urine, A., ii, 672.
- Ribaut, H.**, influence of caffeine on nitrogenous excretion, A., ii, 565.
- Rich, E. M.** See *W. Jackson*.
- Richards, A. N.**, and *William J. Gies*, chemistry of elastic ligament, A., i, 353.
- Richards, Joseph W.**, estimation of iron in magnetite ore by the specific gravity test, A., ii, 132.
- some blowpipe tests, A., ii, 471.
- mohawkite, A., ii, 515.
- short methods of chemical calculation, A., ii, 648.
- Richards, Percy A. E.**, occurrence of barium in the spring water of Boston Spa, A., ii, 252.
- Richards, Theodore William**, a proposal regarding the definition of thermal capacity, A., ii, 223.
- Richards, Theodore William**, and *Ebenezer Henry Archibald*, study of growing crystals by instantaneous photomicrography, A., ii, 546.
- Richards, Theodore William**, and *Frank Roy Fraprie*, solubility of manganous sulphate, A., ii, 553.
- Richards, Theodore William**, *Charles F. McCaffrey*, and *Harold Bisbee*, occlusion of magnesium oxalate by calcium oxalate; solubility of calcium oxalate, A., ii, 624.
- Richardson, Arthur**, a kerosene oil blowpipe, P., 1901, 151.
- Richardson, George M.**, constitution of benzene, A., i, 196.
- Richet, Charles**, muscular serum, A., ii, 117.
- Richter, Andreas**, chemical stimulants; the function of zinc and copper in the nutrition of *Aspergillus niger*, A., ii, 567.
- Richter, E.** See *August Michaelis*.
- Richter, Max**, hemin crystals, A., ii, 296.
- Rickard, T. A.**, telluride ores of Cripple Creek and Kalgoorlie, A., ii, 663.
- Rickards, R.** See *Guido Pellizzari*.
- Ricome, H.**, development of etiolated plants after exposure to light, A., ii, 120.
- Rideal, Samuel**, and *C. G. Stewart*, estimation of dissolved oxygen in waters in presence of nitrites and of organic matter, A., ii, 472.
- Ridenour, W. E.**, estimation of free alkali in the presence of carbonate, A., ii, 691.
- Rieger, E.**, determination of the constitution of complex salts by electrolytic transference, A., ii, 638.
- Riegler, E.**, new method for the detection of "saccharin" and salicylic acid alone or in presence of each other, A., ii, 46.
- a new and sensitive reaction for the detection of formaldehyde and of lactose in milk, A., ii, 206.
- gasometric estimation of formaldehyde, A., ii, 360.
- gasometric estimation of acetone in urine, A., ii, 361.
- a new sensitive test for sugar, A., ii, 426.
- estimation of lactose in milk, A., ii, 698.
- Ries, Heinrich**, limestones of New York and their economic value, A., ii, 321.
- Rietzsch, A.**, thermal and electrical conductivity of copper-phosphorus and copper-arsenic, A., ii, 84.
- Riiber, C. N.**, modification of Landsberger's apparatus for the determination of the elevation of the boiling point, A., ii, 372.
- Riiber, Severin H. R.**, and *C. N. Riiber*, estimation of sucrose and lactose in condensed milk, A., ii, 355.
- Rimbach, Charles**, estimation and composition of humus and its nitrification, A., ii, 37.
- Rimini, Enrico**, biological oxidation of fenchone, A., i, 393.
- new reaction of aldehydes, A., i, 450.
- physiological action of carone, A., ii, 522.
- Rinne, Friedrich**, influence of the presence of iron on the change in state of boracite, A., ii, 111.
- Ripper, Maximilian**, volumetric estimation of aldehydes, A., ii, 205.
- Riquier**. See *Émile Louise*.
- Rising, Adolf**. See *Eugen Bamberger*.
- Ritchie, James**, artificial modifications of toxins, A., ii, 464.
- Rivière, Charles**, refractive index and dispersion of bromine, A., ii, 1.
- Roberts-Austen, Sir William Chandler**, diffusion of gold in solid lead at the ordinary temperature, A., ii, 9.
- Roberts-Austen, Sir William Chandler**, and *Thomas Kirke Rose*, certain properties of alloys of the gold-copper series, A., ii, 25.

- Robertson, *William*. See *Martin Onslow Forster*.
- Robertson, *W. G. Aitchison*, the activity of saliva in various diseased conditions, A., ii, 68.
- Robin, *Albert*, and *Maurice Binet*, respiratory exchange in tuberculosis, A., ii, 327.
- Robine, *R.*, detection of methyl alcohol in vinegar, A., ii, 353, 480.
- Roch, *G.*, sulphosalicylic acid as a test for albumin, A., ii, 710.
- Rochussen, *F.* See *Julius Brédet*.
- Roeder, *Georg*. See *Emil Fischer*.
- Röhm, *Otto*, preparation of methyl acrylate, A., i, 251.
- Röhm, *Otto*. See also *Huns von Pechmann*.
- Roesler, *Julius*, condensation of α -hydroxyisobutaldehyde with acetaldehyde, A., i, 669.
- Rössing, *Adelbert*, polysulphides of copper, A., ii, 100.
- Rogoff, *M.*, action of β -naphthol on aldehydes, A., i, 152.
- Rohde, *Albert*, electrolytic reduction of nitro-compounds, A., i, 135.
- Rohde, *Georg*. See *Wilhelm von Miller*.
- Rohland, *Paul*, hydration processes, A., ii, 18.
- molecular and ionic reactions, A., ii, 152.
- Rohmer, *Martin*, separation of arsenic, A., ii, 194.
- iodometric estimation of antimonious acid and the volumetric estimation of antimony in presence of tin, A., ii, 479.
- Rohrbaech, *E.* aromatic tellurium compounds, A., i, 273.
- Rojahn, *Wilhelm*. See *Hugo von Soden*, and *Otto Wallach*.
- Roman, *Thomas*, and *G. Delluc*, presence of zinc in alcohol, A., ii, 40.
- Romano, *F.* See *Vincenzo Oliveri*.
- Romburgh, *Pieter van*, action of nitric acid on the esters of phenylmethylaminoformic acid, A., i, 201.
- essential oil from the leaves of *Alpinia malaccensis*, A., i, 219.
- essential oil from *Ocimum Basilicum*, A., i, 220.
- Roncagliolo, *Cesare*. See *Guido Pellizzari*.
- Rondeau-Luzeau, *Madame*, action of isotonic solutions of chlorides and sugar on frogs' eggs, A., ii, 400.
- Ronus, *Mar.* See *Hans Rupe*.
- Roozeboom, *Hendrik Willem Bakhuis*, behaviour of mixtures of mercuric iodide and silver iodide, A., ii, 20.
- Roozeboom, *Hendrik Willem Bakhuis*, equilibrium of mixed crystals with the vapour phase, A., ii, 151.
- Roozeboom, *Hendrik Willem Bakhuis*, [and *Byl*], cadmium amalgams, A., ii, 507.
- Rose, *Thomas Kirke*. See *Sir William Chandler Roberts-Austen*.
- Rose-Innes, *J.*, and *Sydney Young*, thermal properties of isopentane compared with those of normal pentane, A., ii, 644.
- Rosell, *C. R.* See *Clarence Livingston Speyers*.
- Rosemann, *Rudolf*, alcohol and proteid metabolism, A., ii, 668.
- Rosenberg, *Siegfried*, fat digestion, A., ii, 403.
- Rosenbusch, [*Karl*] *Harry [Ferdinand]*, carbonaceous gneiss in the Black Forest, A., ii, 113.
- Rosenfeld, *Franz*, asparagine as a food-stuff, A., ii, 177.
- Rosenfeld, *Max*, physiological action of melanoidin and spongimelanoidin, A., ii, 180.
- Rosenfeld, *Maximilian*, lecture experiments, A., ii, 547.
- Rosenheim, *Arthur*, and *Robert Cohn*, double thiocyanates and the ferric thiocyanate reaction, A., i, 455.
- Rosenheim, *Arthur*, and *Ernst Huld-schinsky*, separation of nickel and cobalt, A., ii, 533.
- Rosenheim, *Arthur*, and *Otto Schütte*, double compounds of quadrivalent titanium, A., ii, 244.
- Rosenheim, *Otto*, influence of selenium on certain tests for arsenic, A., ii, 531.
- Rosenheim, *Otto*. See also *Francis W. Tunnicliffe*.
- Rosenstiehl, *Auguste*, reduction of nitro-azo-colouring matters, A., i, 429.
- Rosenthal, *Theodor*, brown-coal tar, A., i, 581.
- Rosin, *Heinrich*, quantitative relationships of carbohydrates in diabetic urine, A., ii, 179.
- Rosinger, *Hugo*, condensation products of isovaleraldehyde, A., i, 669.
- Rosiny, *W.* See *Friedrich Krafft*.
- Rossel, *Arnold*, and *E. Landriset*, analysis of acetylene, A., ii, 202.
- Rosset, *Georges*, electric battery with a depolariser which is spontaneously regenerated by direct reoxidation by the air, A., ii, 434.
- Rossi, *H.* See *Folkmar Kohlschütter*.
- Rossi, *P.* See *Giacomo Ponzio*.
- Rossolimo, *A. I.*, action of ethyl iodide on caffeine, A., i, 161, 480.

- Rostoski, *Otto*, increase of proteid decomposition by protoplasmic poisons, especially chloroform water in *Herbivora*, A., ii, 261.
- Rostowzew, *S.* See *Carl Graebe*.
- Roth, *E.*, *o*-nitrophenyl-2-picolyalkaline and its derivatives; phenyl-2-picolyalkaline, A., i, 165.
- Roth, *Ernst*. See *Rudolph Fittig*.
- Rothé, *E.*, contact electromotive forces and the theory of ions, A., ii, 490.
- Rotschy, *A.* See *Amé Pictet*.
- Rousseaux, *E.* See *Achille Müntz*.
- Rouvière. See *Denoyés*.
- Roux, *E.* See *Léon Maquenne*.
- Rowland, *Sydney*, a method of obtaining intracellular juices, A., ii, 613.
- Rowland, *Sydney*. See also *Arthur Harden*, *Sven Gustav Hedin*, and *Allan Macfadyen*.
- Różycki, *A.* See *Stanislaus von Kostanecki*.
- Rubner, *Max*, capacity of man to adapt himself to high and low temperatures, A., ii, 173.
- skin activity in Europeans and Negroes, A., ii, 173.
- hydrolysis and decomposition of fats and fatty acids in the soil, A., ii, 273.
- Rudolphi, *Max*, molecular refraction of chloral hydrate in solution in various solvents, A., ii, 489.
- Rudorf, *George*, action of heat on potassium permanganate, A., ii, 388.
- Rudorf, *George*. See also *William Ramsay*.
- Ruegenberg, *Max J.*, and *Edgar Francis Smith*, separation of tungsten trioxide from molybdenum trioxide, A., ii, 75.
- Rümker, *Kurt von*, and *H. Hoffmann*, soil of the experimental field of the Royal University of Bremen at Rosenthal, A., ii, 418.
- Rümpler, *A.*, crystallisation of difficultly crystallisable substances, A., ii, 90.
- estimation of potash in soil, A., ii, 196.
- Rüst, *Ernst*. See *Eugen Bamberger*.
- Ruff, *Otto*, nitrogen iodide, A., ii, 16.
- catalytic reactions. I. Aluminium chloride, A., ii, 500.
- [non-existence of ammonium at -95°], A., ii, 600, 653.
- Ruff, *Otto*, [with *Hugo Kohn*, and *Adolf Meusser*], oxidation of *l*-arabonic acid and *l*-xylonic acid, A., i, 449.
- Ruff, *Otto*, and *Victor Stein*, sensitivity of diazo-compounds, especially of 2-diazocarbazole, to light; some new derivatives of carbazole, A., i, 619.
- Ruggeri, *R.* See *Massimo Tortelli*.
- Ruhemann, *Siegfried*, condensation of phenols with esters of the acetylene series. Part V. Homologues of benzo- γ -pyrone, T., 918; P., 1901, 155.
- Ruhemann, *Siegfried*, and *Harold W. Bausor*, condensation of phenols with esters of the acetylene series. Part IV. Benzo- γ -pyrone and its homologues, T., 470; P., 1901, 40.
- Ruhemann, *Siegfried*, and *Ernest Wragg*, condensation of phenols with esters of the acetylene series. Part VI., T., 1185; P., 1901, 187.
- Rulot, *Hector*, hibernation in bats, A., ii, 256.
- Rundqvist, *Carl*, caffetannic acid, A., i, 724.
- Runyan, *E. G.*, new indicator for determining the total acidity of wines, A., ii, 629.
- Rupe, *Hans*, and *Karl von Majewski*, osmophoric groups, A., i, 103.
- preparation of azoimides (triazocompounds), A., i, 104.
- Rupe, *Hans*, and *Max Ronus*, cineolic acid; resolution of *r*-cineolic acid into its optically active components, A., i, 119.
- cineolic acid, III., A., i, 578.
- Rupp, *Erwin*, estimation of mercury in official *hydrargyrum salicylicum*, A., ii, 348.
- Ruppin, *Ernst*, estimation of oxidisable substances in water, A., ii, 201.
- Russell, *H. L.* See *S. Moulton Babcock*.
- Russig, *Friedrich*, and *Georg Fortmann*, estimation of cresol, A., ii, 289.
- Russwurm, *Karl*. See *Hans Stobbe*.
- Rutten, *G. M.* See *Jacobus Martinus van Bemmelen*.
- Ryan, *Hugh*, and *W. Sloan Mills*, preparation of synthetical glucosides, II., T., 704; P., 1901, 90.
- Ryba, *Franz*, chromate from Kraubat, Upper Styria, A., ii, 110.
- Ryder, *John*, and *Alfred Greenwood*, arsenic in beer, A., ii, 280.
- Ryn, *J. J. L. van*, causes of the varying composition of butter, A., ii, 482.

S.

- Sabanéeff, *Alexander P.*, and *M. Prosin*, new class of organic compounds; isonitriles and cyclonitriles, A., i, 695.
- Sabatier, *Paul*, action of a metallic oxide or hydroxide on solutions of salts of other metallic radicles, A., ii, 509.
- Sabatier, *Paul*, and *Jean Baptiste Senderens*, direct hydrogenations effected in the presence of reduced nickel: preparation of hexahydrobenzene, A., i, 195.

- Sabatier, Paul**, and **Jean Baptiste Senderens**, general method for the synthesis of naphthenes, A., i, 263.
- — — hydrogenation of aromatic hydrocarbons, A., i, 459.
- — — new method for preparing aniline and analogous bases, A., i, 638.
- Sabbatani, Luigi**, calcium and sodium citrates in the coagulation of the blood, lymph, and milk, A., ii, 175.
- Sabbath, S.** See **Leopold Spiegel**.
- Sachs, Franz**, and **Hermann Barschall**, $\beta\gamma\delta$ -triketopentane, I., A., i, 670.
- Sachs, Franz**, and **Eduard Bry**, condensation of aromatic nitroso-compounds with methylene derivatives, III., A., i, 229.
- Sachs, Franz**, [and, in part, **Eduard Bry**, and **C. Meredith Whittaker**], preparation of anils [phenylimides] of acid cyanides, A., i, 272.
- Sack, J.** See **Maurits Greshoff**, and **J. J. Murumow**.
- Sackur, Otto**, electrolytic short circuits in liquid cells, A., ii, 591.
- — — dissociation of strong electrolytes, A., ii, 591.
- — — influence of the addition of a salt with one similar ion on the E.M.F. of electrolytic cells; a contribution to the knowledge of the behaviour of strong electrolytes, A., ii, 636.
- Saito, S.**, and **K. Katsuyama**, sugar in normal hen's blood, A., ii, 404.
- — — formation of lactic acid in the organism, A., ii, 405.
- Salaskin, Sergei**, formation of leucinimide by the peptic and tryptic fermentation of oxyhaemoglobin and of globin, A., i, 622.
- Salaskin, Sergei**. See also **S. Dzierzgowski**, and **Katharina Kowalewski**.
- Salkind, Julius**. See **Otto Wallach**.
- Salkowski, Ernst** [**Leopold**], invertase from yeast, A., i, 180.
- — — precipitation of proteids by chloroform, A., i, 241.
- — — acid containing phosphorus from casein, and its iron compound, A., i, 242.
- — — parannucleic acid from casein, I., A., i, 434.
- — — estimation of glycogen by the Pflüger-Nerking method, A., ii, 135.
- — — behaviour of pentoses, especially *L*-arabinose, in the animal body, A., ii, 521.
- Salkowski, Heinrich** [**Hermann**], usnic acid; rotation of other lichen acids, A., i, 152.
- — — new hydrate of normal sodium chromate, A., ii, 514.
- Salomon, Harry**. See **Rudolph Fittig**.
- Saltet, R. H.**, [and **C. S. Stockvis**], reduction of sulphates in brackish water by Bacteria, A., ii, 265.
- Salvadori, Roberto**, study of hydrolytic dissociation by means of electrical conductivity, A., ii, 4.
- — — combustion of nitrogen, A., ii, 94.
- — — lecture experiments to demonstrate the principle of conservation of weight, A., ii, 547.
- Samelson, S.**, azo-compounds derived from *m*-toluidine, A., i, 170.
- Sammis, J. L.** See **Hurry S. Grindley**.
- Samoiloff, Alexandr A.**, Mett's method of estimating peptic activity, A., ii, 401.
- Samoiloff, Alexandr A.**, and **A. Judin**, gas analysis apparatus, A., ii, 621.
- Samoiloff, J.**, turgite from the Uspensk Mine, South Urals, A., ii, 605.
- Sand, Henry J. S.**, concentration at the electrodes in a solution, with special reference to the liberation of hydrogen in the electrolysis of a mixture of copper sulphate and sulphuric acid, A., ii, 82.
- — — thermodynamical observations, A., ii, 303.
- Sand, Julius**, constitution of the compounds of ethylene and allyl alcohol with mercuric salts, A., i, 458.
- — — cyclic mercury-carbon compounds, A., i, 682.
- — — preparation of morpholine from ethylene by means of the mercury ethyl ether salt, A., i, 741.
- Sanders, Warren W.** See **James F. Norris**.
- Sargent, Charles L.**, production of alloys of tungsten and molybdenum in the electric furnace, A., ii, 105.
- Sarthou, J.**, contribution to the study of the oxydases, A., i, 624.
- Sartori, A.**, estimation of phosphoric acid in wines by the official method, A., ii, 344.
- — — tables for the calculation of quantitative analyses, A., ii, 574.
- Satie, C.** See **Paul Jeancard**.
- Saunders, A. P.**, reaction between chloroform and potassium hydroxide, A., ii, 13.
- Savage, William G.**, neutral-red in the bacteriological examination of water, A., ii, 696.
- Sawjaloff, W. W.**, theory of proteid digestion, A., ii, 403.
- Sazerac, R.** See **Gabriel Bertrand**.
- Scarafia, Pietro**, composition and nutritive value of malt germs and the dried residues of germinated barley from Italian breweries, A., ii, 683.

- Schäfer, *Alfred*. See *Otto Wallach*.
 Schäfer, *Edward Albert*. See *R. Magnus*.
 Schäfer, *K.* See *Alfred Wohl*.
 Schaer, *Eduard*, physical and chemical changes in solutions of ferric salts, A., ii, 603.
 Schaeuble, *Alfred*. See *August Michaelis*.
 Schall, [*Joh. Friedrich*] *Carl*, carbodi-phenylimide, A., i, 766.
 — determination of vapour density under reduced pressure, A., ii, 87.
 Schattenfroh, *Arthur*, [obesity in relation to respiration], A., ii, 174.
 Schaum, *A.* See *Hermann Pauly*.
 Schaum, *Karl*, influence [of benzyl alcohol] on the potential of oxidation cells, A., ii, 300.
 Schauwecker, *Otto*. See *Carl D. Harries*.
 Scheel, *Karl*. See *Max Thiesen*.
 Schéele, *Carl von*, praseodymium, A., ii, 387.
 Scheibe, *Anton*, estimation of milk sugar by polarisation and reduction, A., ii, 204.
 Scheid, *Karl*, derivatives of 2-chloronaphthalene, A., i, 520.
 Schentschuschny, *S.*, and *Nicolai S. Kurnakoff*, transformation of mirabilite into thenardite, A., ii, 605.
 Schenek, *Rudolf*, sulphur trioxide, A., ii, 380.
 Scherpenzeel, *L. van*, oxidation of mesityl methyl ketone and the preparation of trimethylbenzoic acid, A., i, 328.
 — action of pure nitric acid on the three toluic acids and on their derivatives, A., i, 592.
 Scheuermann, *Beda*. See *Fritz Fichter*.
 Scheutz, *Thor*. See *Eugen Bamberger*, and *Robert Gnehm*.
 Schiavo-Leni, *F.* See *Giuseppe Grassi-Cristaldi*.
 Schiavon, *Guido*, constitution of citric acid derivatives, A., i, 666.
 Schiess, *Heinrich*. See *Fritz Fichter*.
 Schiff, *Hugo*, aniline and quinoline derivatives of metallic trichlorides, A., i, 375.
 — methylenemalonamide and methylenebiuret, A., i, 457.
 Schiffer, *Emil Chr.*, dolomite from Ceylon, A., ii, 110.
 Schilling, *Bruno*, 2:3-diaminobenzoic acid and its compounds with the sugars, A., i, 385.
 Schilling, *Rudolf von*. See *Daniel Vorländer*.
 Schimmel & Co., ethereal oils, A., i, 394.
 Schimpff, *W.* See *Ludwig Wolff*.
 Schindelmeiser, *Iwan*, solubilities of alkaloids in carbon tetrachloride, A., i, 287.
 Schischkowsky, *B.*, and *Sergius N. Reformatsky*, synthesis and properties of α -dimethyl- β -ethylhydraacrylic acid, A., i, 311.
 Schjerning, [*Niels Christian*] *Henrik*, estimation of proteids of fodder, A., ii, 79.
 Schlagdenhauffen, *Charles Frédéric*, and *E. Reeb*, a new glucoside extracted from the seeds of *Erysimum aureum*, a member of the Cruciferae, A., i, 39.
 Schlegelmilch, *Fr.* See *Rudolph F. Weinland*.
 Schlenker, *Julius*, 4:5-dimethylpyrimidine, A., i, 762.
 Schlesinger, *Alfred*. See *Carl Bülow*.
 Schloësing, [*Jean Jacques*] *Théophile*, condition of aluminium in vegetable soils, A., ii, 471.
 Schloësing, *Th.*, jun., gaseous exchanges between plants and the atmosphere, A., ii, 31.
 — phosphoric acid in soils, A., ii, 470.
 Schlundt, *Herman*, dielectric constants of nitriles, A., ii, 299.
 Schmatolla, *Otto*, detection of tin, A., ii, 580.
 — determination of the saponification number of fats, A., ii, 630.
 Schmid, *Bastian*, condensation of α -benzyleinnamic acid (benzylidenehydrocinnamic acid) to α -benzylidenehydrindone, A., i, 210.
 Schmid, *Julius*. See *Martin Krüger*.
 Schmidt, *Ernst* [*Albert*], alkaloids of the Papaveraceae, A., i, 742.
 Schmidt, *Ernst*, [with *Waljaschko*], robinin and rutin, A., i, 602.
 Schmidt, *Julius*, transformation of maleic acid into fumaric acid, A., i, 63.
 — the phenanthrene series: action of nitrous acid on phenanthrene, A., i, 76.
 — action of nitrous acid on α - and β -naphthols, A., i, 81.
 — action of nitrous acid on benzoquinone, A., i, 88.
 — the two stereoisomeric diphenyldinitroethylenes (dinitrostilbenes, toluene dinitrites), A., i, 266.
 — action of nitrous acid on stilbene; *s*-diphenyldinitroethane (stilbene dinitrite), A., i, 266.
 — synthesis of $\alpha\beta\gamma\delta$ -tetraphenylpiperazine, A., i, 295.
 Schmidt, *Julius*, and *Max Strobel*, 9-aminophenanthrene, A., i, 464.
 Schmidt, *Otto*. See *Eugen Bamberger*.

- Schmidt, Paul.** See *Johannes Wislicenus*.
- Schmidt, R.,** cyclocitral semicarbazone, A., i, 599.
- Schmidt, R.** See also *Ferdinand Tie-mann*.
- Schmidt, Sigval,** chemical and micro-biological investigations on the salting of herrings, A., ii, 409.
- Schmiedberg, Oswald,** comparative investigations of the pharmacological actions of some purine derivatives, A., ii, 674.
- Schmitz,** estimation of carbon in steel and iron, A., ii, 691.
- Schmoellings, Leo von,** cedar-nut oil, A., ii, 136.
- Schneider, Edward C.,** variations in the amount of thiocyanate in human saliva, A., ii, 459.
- Schneider, Edward C.** See also *Lafayette B. Mendel*.
- Schneider, Franz.** See *Otto Nikolaus Witt*.
- Schneidewind, W.** See *W. Krüger*.
- Schober, William B., and Henry L. Bowers,** action of sulphuric acid on phenetole, A., i, 204.
- Schöfer, Alwin,** propyl- ψ -nitrole and s-tetramethylidinitroazoxymethane, A., i, 495.
- Schöfer, Alwin.** See also *Roland Scholl*.
- Schöne, A., and Bernhard Tollens,** lactic acid in beet-molasses, A., i, 116.
- behaviour of sucrose solutions towards strontia at 125–128°, A., i, 128.
- fermentation of pentoses, A., i, 367.
- behaviour of the pentosans of seeds during germination, A., ii, 267.
- pentosans of jute, luffa, and brewers' grains, A., ii, 414.
- Schönherr, Paul.** See *August Michaelis*.
- Schönrock, Otto,** influence of temperature on the specific rotation of sucrose, A., ii, 287.
- Scholl, Roland,** condensation products of aliphatic nitro-compounds, A., i, 359.
- Scholl, Roland, and Ernst Bertsch,** synthetical application of mercury fulminate; synthesis of phenol ald-oximes, A., i, 465.
- oxidising action of mercury fulminate on dimethylaniline, A., i, 523.
- Scholl, Roland, and Wilhelm Nörr,** [action of cyanogen bromide on dimethylaniline], A., i, 376.
- Scholl, Roland, and Alwin Schöfer,** action of ethyl bromoacetate on silver nitrite, A., i, 359.
- Scholl, Roland.** See also *H. Korten*.
- Scholtz, Max,** stereoisomeric 2:6-di-phenylpiperidines, A., i, 483.
- resolution of an optically inactive base by an active alkyl haloid, A., i, 749.
- Scholtz, Max, and K. Jaross,** action of aldehydes and of carbonyl chloride on diamines, A., i, 485.
- Scholtz, Max, and Helmut Müller,** stereoisomeric 2-phenyl-6-methyl-piperidines, A., i, 41.
- Schoorl, N.,** carbamide derivatives of sugars, A., i, 258.
- microchemical reaction for atropine, A., ii, 707.
- Schramm, Otto.** See *Johannes Wislicenus*.
- Schreinemakers, Frans Antoon Hubert,** composition of the vapour phase in the system water-phenol, with one and two liquid phases, A., ii, 9.
- vapour pressures of binary and ternary mixtures, A., ii, 57.
- vapour tension of ternary mixtures, A., ii, 146, 224, 305, 372, 436, 641.
- equilibria in ternary systems, A., ii, 445.
- Schreiner, Oswald,** phellandrene nitrite and oils containing phellandrene, A., i, 600.
- Schreuer, Max.** See *Johannes Frenzel*.
- Schrödter, M.** See *Daniel Vorländer*.
- Schryver, Samuel Barnett, and Frederick H. Lees,** researches on morphine. Part II, T., 563; P., 1901, 54.
- Schtarbanow, P.** See *P. N. Raikow*.
- Schubart, P.** See *Daniel Vorländer*.
- Schükareff, A.,** polymolecular chemical transformations, A., ii, 647.
- Schürger, Johann,** calcium amalgam, A., ii, 97.
- Schütte, Otto.** See *Arthur Rosenheim*.
- Schuler, W.,** sensitiveness of the reactions based on spectrum analysis, A., ii, 633.
- Schulten, August [Benjamin (Baron)] de,** synthesis of boronatrocalcite (alexite), A., ii, 558.
- Schulz, Ferdinand,** hydrolysis of solanin, A., i, 92.
- Schulz, Friedrich N.,** formation of carbamide by the oxidation of albumin according to Jolles, A., i, 780.
- cause of the increase of proteid decomposition during inanition, A., ii, 562.
- Schulz, Friedrich N., and Fritz Dittborn,** galactosamine, A., i, 507.
- the sugar obtained from cere-brin, A., i, 554.

- Schulz, Friedrich N.**, and **J. Mainzer**, excretion of phosphorus during inanition, A., ii, 407.
- Schulz, Hugo**, silicic acid in human and animal tissues, A., ii, 257.
- Schulze, Bernhard**, alinit experiments with oats, A., ii, 527.
- experiments with calcium carbonate on serradella, A., ii, 528.
- experiments with different nitrogenous manures (ammonia and sodium nitrate), A., ii, 620.
- plot and pot experiments with different potassium salts, A., ii, 621.
- testing of various soils as regards their manurial requirements, A., ii, 681.
- examination of hay to ascertain the changes in the amounts of food constituents, phosphoric acid, and potash caused by different manuring, A., ii, 682.
- Schulze, Ernst**, reproduction of proteids from the products of their decomposition, A., ii, 184.
- mode of formation of asparagine in plants, A., ii, 332, 467.
- influence of carbohydrates on the production of proteids in plants, A., ii, 333.
- composition of some conifer seeds, A., ii, 467.
- Schulze, Heinrich**. See **Carl Paal**, and **Eugen Prior**.
- Schumacher, A.** See **Albert Edinger**.
- Schumacher, Th.** See **Eberhard Ramm**.
- Schumann-Leclercq**, experiments on the influence of diet on the separation of acetone, A., ii, 463.
- Schumm, O.**, estimation of potassium, A., ii, 578.
- Schumm, O.** See also **Hartogh**.
- Schunck, C. A.**, yellow colouring matters accompanying chlorophyll and their spectroscopic relations, A., i, 734.
- Schuyten, M. C.**, decomposition of iodoform in chloroform solution, A., i, 3.
- Schwab, Otto**, condensation of *o*-hydroxybenzylideneaniline, A., i, 380.
- Schwab, Otto**. See also **Arthur Hantzsch**.
- Schwarz, B.** See **Karl Elbs**.
- Schwarz, Leo**, compounds of proteids with aldehydes, A., i, 297.
- Schwerin, B. Graf**. See **Oscar Piloty**.
- Scott, Alexander**, ammonium bromide and the atomic weight of nitrogen, T., 147; P., 1900, 204.
- Scott, Alexander**, and **William Arbuckle**, the preparation of iodic acid, T., 302; P., 1901, 2.
- Scudder, Heyward**. See **S. P. Mulliken**.
- Sebelien, John**, manurial experiments, A., ii, 468.
- Sebor, J.**, carbohydrates of Carageen moss, A., i, 15.
- Seegen, Josef**, influence of asphyxia on the glycogenic function of the liver, A., ii, 522.
- Seel, Eugen**, oxidation of aloin with potassium persulphate and with Caro's acid, A., i, 92.
- Seelhorst, Conrad von**, and **N. Georgs**, influence of manure and the amount of water in the soil on the growth and composition of barley, A., ii, 274.
- Seelhorst, Conrad von**, **N. Georgs**, and **Fahrenheitz**, influence of the amount of water in the soil, and the manure, on the yield and composition of Italian rye grass and clover, A., ii, 682.
- Seelhorst, Conrad von**, and **Panaotovic**, influence of distance on the growth and composition of plants, A., ii, 330.
- Seemann, John**. See **Fr. Kutscher**.
- Seldis, R.** See **Friedrich Krafft**.
- Seligmann, R.** See **Eugen Bamberger**.
- Seliwanoff, Theodor T.**, drain-water and salt swamps of the Odessa irrigation fields, A., ii, 530.
- Seliwanoff, Theodor T.**, **Choina**, **Mot-schan**, and **Bondareff**, composition of Odessa sewage, A., ii, 530.
- Sell, William James**, and **Frederick William Dootson**, the chlorine derivatives of pyridine. Part VII. Some condensation products, T., 899; P., 1901, 131.
- Semmler, Friedrich Wilhelm**, camphene, A., i, 90.
- elimination of water, halogen hydride, and ammonia in the terpene series, A., i, 330.
- reduction in the terpene series; myrcene and other olefinic compounds, A., i, 732.
- Senderens, Jean Baptiste**. See **Paul Sabatier**.
- Sénéquier, E.** See **L. Duclert**.
- Senf, Fr. A.** See **Alexander Eibner**.
- Senier, Alfred**, a lecture table experiment for the preparation of nitric oxide, P., 1900, 227.
- Senier, Alfred**, and **William Goodwin**, the action of ethylene dibromide on xylydine and ψ -cumidine, T., 254; P., 1900, 228.
- action of phenylcarbimide on diphenyl-, dialphyl-, and dinaphthyl-diamines, T., 258; P., 1900, 228.
- Serdobinsky, Miss A.**, and **Miss A. Emelianoff**, determination of the specific heats of metals by their rate of cooling, A., ii, 303.

- Servais, *Léon*, α -chlorovaleric acids, A., i, 112.
- Servant. See *William Oechsner de Coninck*.
- Sesti, *Giuseppe*, analysis of tanning materials, A., ii, 708.
- Seubert, *Karl*, and *A. Henke*, iodometric estimation of chromic acid, A., ii, 132.
- Seuffert, *Otto*. See *Adolf von Baeyer*, and *Emil Fischer*.
- Severin, *Emile C.*, mixed anhydrides, A., i, 385.
- *Le Royer's* dichlorophthalic acid, A., i, 389.
- Seyda, *Anton*, simplification of *Meineke-Woy's* method of estimating phosphoric acid as phosphomolybdic oxide; precipitation of pure ammonium phosphomolybdate by molybdate solution containing citric acid; conversion of *Wagner's* molybdate magnesia process into a purely molybdate one, A., ii, 689.
- Seyewetz, *Alphonse*, and *Edouard Blanc*, combination of sodium tetrazoditolyl-disulphonate with β -naphthylethylamine; production of a colouring matter, A., i, 621.
- Shaffer, *Phil A.* See *Otto Folin*.
- Shaw, *Saville*, obituary notice of, T., 875.
- Shenstone, *William Ashwell*, vitrified quartz, A., ii, 552.
- Shenton, *James Porter*. See *William Thomson*.
- Shepard, *C. H.*, [estimations with the] nitrometer, A., ii, 474.
- Sherman, *H. C.*, and *J. F. Snell*, heat of combustion as a factor in the analytical examination of oils: heats of combustion of some commercial oils, A., ii, 430.
- Shimer, *Porter W.*, special crucible for carbon combustions, A., ii, 477.
- Shoffstall, *Arthur S.* See *F. J. Pond*.
- Shores, *J. B.* See *James Terence Conroy*.
- Shuloff, *I.*, chemical changes in the germination of seeds of *Vicia Faba*, A., ii, 330.
- Siau, *R. L.* See *Frederick William Pavy*.
- Sicherer, *Walther von*. See *Carl Bülow*.
- Sieber, *Natalie*, action of peroxides on toxins, A., ii, 566.
- Sieber, *Natalie*. See also *Marcellus Nencki*.
- Siegfeld, *Moritz*, butter control and the *Reichert-Meißl* figure, A., ii, 482.
- Siegfeld, *Moritz*. See also *Paul Vieth*.
- Siegfried, *Mas*, antipeptone, A., i, 57.
- antipeptone and amphopeptone, A., i, 176.
- Siegrist, *Jos.*, rate of electrolytic deposition of copper in presence of sulphuric acid, A., ii, 370.
- Sieplein, *Otto J.* See *Charles Frederic Mabery*.
- Siertsema, *L. H.*, magnetic rotation of the plane of polarisation in liquefied gases under atmospheric pressure, I., A., ii, 5.
- Sigel, *Alb.* See *Carl Haussermann*.
- Sigmond, *Alexius von*, assimilation in two cultivated plants, A., ii, 70.
- Silber, *Paul G.* See *Giacomo Luigi Ciamician*.
- Silbermann, *F.* See *Karl Elbs*.
- Silberstein, *M.* See *Friedrich Kehrmann*.
- Simmonds, *Charles*. See *Thomas Edward Thorpe*.
- Simon, *E.* See *Alexander Eibner*.
- Simon, *L. J.*, stereochemistry of nitrogen: stereoisomeric hydrazones of ethyl pyruvate, A., i, 49.
- constitution of dextrose, A., i, 256.
- Simon, *L. J.*, and *H. Bénard*, the phenylhydrazones of dextrose and their mutarotation, A., i, 257.
- Simon, *L. J.*, and *L. Dubreuil*, action of monohaloid aliphatic acids on pyridine and quinoline, A., i, 290.
- Simonis, *Hugo*, action of primary amines on mucobromic and mucochloric acids and their esters, A., i, 268.
- bromo-derivatives of coumarone, A., i, 335.
- Sims, *Frank D.* See *Charles A. Crampton*.
- Simpson, *Edward S.*, [gold, &c., from Western Australia], A., ii, 454.
- Singer, *H.*, physiological action of aspirin, A., ii, 408.
- Sioma, *J.*, analysis of white microcline from the *Ilmen Mountains*, A., ii, 397.
- Sisley, *Paul*, theories of dyeing, A., i, 99.
- sulphonated hydroxyazo-colouring matters and their salts, A., i, 775.
- Sjollema, *B.*, the thiocarbimide from the seeds of *Brassica napus* (colza), A., i, 583.
- chemical analysis of soils, A., ii, 350.
- Skirrow, *Frederick William*, volatility of boric acid in steam, A., ii, 448.
- Skirrow, *Frederick William*, and *Harry T. Calvert*, salt precipitation by vaporisation of dilute solutions, A., ii, 440.
- Skita, *Aladar*. See *Emil Fischer*.
- Skraup, *Zdenko Harns*, constitution of the cinchona alkaloids. VI. Conversion of cincholeuponic acid into an acid free from nitrogen, A., i, 226.
- transformation of cinchonine by means of sulphuric acid, A., i, 404.

- Skraup, Zdenko Hanns**, conversion of the additive compounds of cinchonine with hydrogen haloids into halogen-free bases, A., i, 480.
- Skraup, Zdenko Hanns**, and **Josef König**, cellulose, a biose from cellulose, A., i, 370.
- Skraup, Zdenko Hanns**, and **Robert Kre-mann**, acetochloro-dextrose, -galactose, and -lactose, A., i, 506.
- Sleen, G. van der**, α -hydroxy- β -butenoic acid (vinylglycollic acid) and its decompositions, A., i, 499.
- Slosson, E. E.** See **Julius Stieglitz**.
- Slowtsoff, B.**, vegetable oxidases, A., i, 177.
- Smith, C. D.**, factors determining the richness of milk, A., ii, 338.
- Smith, Edgar Francis.** See **G. Clausen Friend**, **W. H. Fulweiler**, **Lewis P. Hamilton**, **Lily G. Kollock**, **Aaron Merzbacher**, **Leonard P. Morgan**, **Max J. Ruegenberg**, and **C. Roscoe Spare**.
- Smith, Frank Warren**, analysis of explosives, A., ii, 699.
- Smith, Henry G.**, eucalyptus oil containing 60 per cent. of geranyl acetate, A., i, 282.
- Smith, James F.**, detection of arsenic in the presence of sulphites, &c., A., ii, 279.
- Smith, James Lorrain**, and **A. Percy Hoskins**, inhalation of ethylene, A., ii, 464.
- Smith, Robert Francis Wood**, and **Robert Leonard Jenks**, arsenic in coal and coke, A., ii, 476.
- Smithells, Arthur**, spectra of carbon compounds, A., ii, 366.
- Smits, A.**, new method for the exact determination of the boiling point, A., ii, 5.
- soap solutions, A., ii, 12.
- determination of the decrease of vapour tension of a solution of sodium chloride at higher temperatures, A., ii, 304.
- determination of the decrease in vapour tension, and of the lowering of the freezing point of solutions which are not very dilute, A., ii, 304.
- progressive change of the factor i as a function of the concentration, A., ii, 436.
- Smits, A.**, and **L. K. Wolff**, repelling of the ionisation of solutions of sodium hydroxide, carbonate, and hydrogen carbonate by addition of sodium chloride, A., ii, 505.
- Smyčka, F.**, meteoric iron from Alt-Bělá, Moravia, A., ii, 607.
- Smythe, John Armstrong.** See **Frederick Charles Garrett**.
- Snell, J. F.** See **H. C. Sherman**.
- Soave, Marco**, alleged volatility of mercurous chloride at 37°; reduction of mercurous compounds by animal tissues, A., ii, 101.
- physiological function of enzymes in vegetable life, A., ii, 267.
- hydrocyanic acid in plants, A., ii, 332.
- Sodeau, William Horace**, the decomposition of chlorates. Part III. Calcium chlorate and silver chlorate, T., 247; P., 1900, 209.
- the decomposition of chlorates. Part IV. The supposed mechanical facilitation of the decomposition of potassium chlorate, T., 939; P., 1901, 149.
- Soden, Hugo von**, and **Karl Henle**, Algerian oil of rue, A., i, 396.
- Soden, Hugo von**, and **Wilhelm Rojahn**, occurrence of phenylethyl alcohol in oil of roses, A., i, 39, 733.
- constituents of West Indian sandalwood oil, A., i, 159.
- crystalline component of calamus oil, A., i, 395.
- a new aldehyde from oil of lemons, A., i, 733.
- Söchtig, Wilhelm.** See **August Michaelis**.
- Söderbaum, Henrik Gustave**, separation of metals by means of acetylene, A., ii, 197.
- Söldner, Friedrich.** See **William Camerer, jun.**
- Solaro, A.**, artificial silk and its distinction from the natural product, A., ii, 52.
- Solleid, P. R.**, seaweed as food, A., ii, 529.
- Sollmann, T.**, a new sugar reaction A., ii, 535.
- Solly, Richard Harrison**, [with analysis by **Henry Jackson**], liveingite, a new mineral from the Binnenthal, A., ii, 558.
- Soltsien, Paul**, estimation of sugar by Fehling's solution, and conversion of cuprous into cupric oxide without the use of asbestos filters, A., ii, 286.
- Halphen's reaction for cotton seed oil and the behaviour of some American lards towards the same, A., ii, 292, 430.
- Soncini, E.** See **Giuseppe Plancher**.
- Sorauer, Paul**, and **Emil Ramann**, so-called invisible injury [to trees] by smoke, A., ii, 36.
- Sosnowski, J.** See **Leon Marchlewski**.
- Source.** See **Magnier de la Source**.

- Spaeth, Eduard**, analyses of fruit juices, A., ii, 294.
 — analysis and composition of lemon juices, A., ii, 584.
- Spallino, R.** See **Alberto Peratoner**.
- Spare, C. Roscoe**, and **Edgar Francis Smith**, electrolytic separation of mercury from copper, A., ii, 692.
- Spatz, E.**, estimation of aluminium in steel, A., ii, 349.
- Specht, Leopold**, and **Fritz Lorenz**, new tannin estimations, A., ii, 294.
- Speller, Frank L.**, separation of ferric chloride in aqueous hydrochloric acid from other metallic chlorides by ether, A., ii, 350.
- Spencer, Leonard James**, marshite, miersite, and iodyrite, A., ii, 394.
- Spencer, Leonard James**, and **George Thurland Prior**, crystallised stannite from Bolivia, A., ii, 392.
- Speranski, Nicolai**. See **Otto Wallach**.
- Speransky, A. W.**, and **E. G. Goldberg**, electrolysis of salts in organic solvents, A., ii, 157.
- Speroni, Cesare**. See **Mario Betti**.
- Speyers, Clarence Livingston**, and **C. R. Rosell**, heat of solution of resorcinol in ethyl alcohol, A., ii, 147.
- Spezia, Giorgio**, colour of zircon, A., ii, 167.
 — quartz and gelatinous silicic acid from the Simplon Tunnel, A., ii, 393.
 — solubility of quartz in solutions of sodium tetraborate, A., ii, 605.
- Spica, Matteo**, detection of citric acid in wine, A., ii, 701.
 — detection of "saccharin" by means of new reactions, A., ii, 704.
 — commercial valuation of tanning materials and a new method for the detection and estimation of gallic acid in them, A., ii, 708.
- Spica, Pietro**, supposed alteration of the properties of aluminium, A., ii, 602.
- Speckermann, Alb.** See **Josef König**.
- Spiegel, Leopold**, [with **Katzenellenbogen**], α -dinitrophenylpyridine chloride and the product of its transformation under the influence of alkali, A., i, 752.
- Spiegel, Leopold**, and **S. Sabbath**, ethers of *p*-aminophenol and their carbamide derivatives, A., i, 533.
- Spiegler, Albert**, effect of the withholding of water on metabolism, A., ii, 458.
- Spieess, Paul**. See **Wilhelm Autenrieth**.
- Spilker, Adolf**. See **Gustav Kraemer**.
- Spindler, W.** See **Bernhard Kühn**.
- Spiro, Karl**, the action of serum-globulin on the coagulation of muscle plasma, A., ii, 670.
- Spiro, Karl**. See also **E. Fuld**, and **Ernst P. Pick**.
- Spitzer, Fritz**, β -naphthoxyacetic acid and its derivatives, A., i, 715.
- Spitzer, Oskar**, action of nitrosobenzene on aromatic hydrazines, A., i, 98.
- Sprague, E. C.** See **Harry S. Grindley**.
- Sprankling, Charles H. G.** See **Alexander William Gilbody**.
- Spriggs, E. I.** See **W. Hale White**.
- Spring, Walther**, illumination of different kinds of glass, A., ii, 297.
 — specific gravity of cuprous iodide, A., ii, 451.
- Springer, L.** See **Georg von Georgievics**.
- Sprinkmeyer, H.**, *o*-isopropyltoluene [*o*-methylisopropylbenzene], A., i, 519.
- Sprinz, Julius**, isovalantolactone, a by-product in the preparation of alantolactone, A., i, 325.
 — isovalantolactone, a constituent of the root of *Inula Helenium*, A., i, 387.
- Staněk, V.**, apparatus for the estimation of nitrogen in nitrates by the Schulze-Tiemann method, A., ii, 474.
- Staněk, V.** See also **Karl Andrlík**.
- Stange, M.** See **D. Holde**.
- Starke, Johannes**, globulin as alkali-proteid, A., i, 242.
 — transformation of albumin into globulin, A., i, 242.
- Stassano, Henri**, rôle of leucocytes in excretion, A., ii, 564.
- Stassano, Henri**, and **Paul Bourcet**, presence and localisation of iodine in the leucocytes of normal blood, A., ii, 518.
- Steele, Bertram D.**, a new method for the measurement of ionic velocities in aqueous solution, T., 414; P., 1901, 5.
 — model illustrating measurements of the mobility and transference of ions, A., ii, 540.
- Stein, Stanislaus von**, the influence of various substances on the crystallisation of hæmoglobin, A., i, 176.
- Stein, Victor**. See **Otto Ruff**.
- Steinbreck, Adolf**. See **Paul Jacobson**.
- Steiner, G.** See **Friedrich Kehrmann**.
- Steiner, O.**, phenyl telluride and the atomic weight of tellurium, A., ii, 236.
- Steiner, O.** See also **Friedrich Krafft**.
- Steinwehr, H. von**, applicability of the law of mass action to strong electrolytes, A., ii, 539.
 — thermochemistry of very dilute solutions, A., ii, 641.
- Stejskal, Karl** [*Ritter*] **von**, febrile changes in the chemical composition of blood, A., ii, 404.
- Steller, Wilhelm**. See **Theodor Curtius**.

- Stelling, Erwin.** See *Augustin Bis-trzycki*.
- Stephan, Karl**, oil of sweet orange, A., i, 160.
- Steppes, Friedrich**, *p*- and *o*-toluidino-acetic acid and α -*p*- and α -*o*-toluidino-propionic acid, A., i, 139.
- Sterba, Jean**, preparation of pure cerium oxide, A., ii, 602.
- crystallised cerium oxide, A., ii, 602.
- Stern, Arthur Landauer**, the nutrition of yeast, T., 943; P., 1901, 126.
- Stern, Hermann.** See *Carl Paal*.
- Sternberg, Maximilian**, a new reaction of acetone, A., ii, 587.
- Sternberg, Wilhelm.** See *Rudolph Fittig*.
- Steuart, Basil**, composition of shale naphtha, A., i, 109.
- Steudel, H.**, constitution of thymine, A., i, 108, 434.
- detection of amino-derivatives of sugars, A., i, 674.
- behaviour of pyrimidine compounds in the animal organism, A., ii, 409.
- Steuermann, J.** See *Stanislaus von Kostanecki*.
- Stevens, A. B.**, assay of opium, A., ii, 631.
- Stevens, Henry Potter**, metathoric acid and metathorium oxychloride, A., ii, 391.
- Stevens, N. M.**, rigor in frog's muscles, A., ii, 519.
- Stewart, C. G.** See *Samuel Rideal*.
- Stewart, George Neil**, behaviour of red blood corpuscles to certain reagents, A., ii, 457.
- Stich, Konrad**, phosphorised oil, A., ii, 422.
- Stieglitz, Julius**, and *E. E. Slösson*, constitution of acylhalogenalkylamides, A., i, 462.
- Stiepel, Carl.** See *Alexander Herzfeld*.
- Stift, Anton**, chemical composition of the pollen of the sugar beet, A., ii, 411.
- Stiles, Percy G.**, rhythmic activity of the esophagus, A., ii, 519.
- Stille, W.** See *Rudolph F. Weinland*.
- Stirm, Carl.** See *Carl D. Harries*.
- Stobbe, Hans**, addition of diethyl succinate to $\alpha\beta$ -unsaturated ketones and esters, A., i, 276.
- Stobbe, Hans**, [and, in part, *Georg Heun*], action of sodium ethoxide on mixtures of ketones and ethyl malonate, A., i, 549.
- Stobbe, Hans**, [with *Karl Russwurm*, and *Richard Fischer*], addition of diethyl succinate to $\alpha\beta$ -unsaturated ketones and esters, A., i, 147.
- Stobbe, Hans**, [and, in part, *Hans Volland*], a simple synthesis of δ -ketonic acids, A., i, 324.
- Stobbe, Hans**, and *Otto Zeitschel*, triphenylacrylic acid and benzhydrol ether, A., i, 538.
- Stock, Alfred**, action of hydrogen arsenide on boron bromide, A., ii, 382.
- Stock, Alfred**, and *Martin Blix*, borinide, A., ii, 650.
- Stock, Alfred**, and *Walther Doht*, preparation of pure antimony hydride, A., ii, 556.
- Stock, Alfred**, and *Cornelius Massaciu*, estimation of chromium and iron by potassium-iodide-iodate mixture, A., ii, 284.
- Stock, Alfred**, and *Otto Poppenberg*, action of hydrogen sulphide on boron bromide, A., ii, 237.
- Stockman, Ralph**, and *Francis J. Charteris*, the action of iodine and iodides on frog's muscles, A., ii, 255.
- Stoermer, M.**, volatility of lead oxide, A., ii, 654.
- Stoermer, Richard**, nomenclature of coumarone derivatives, A., i, 400.
- Stoermer, Richard**, and *F. Bartsch*, synthesis of coumarone (ketocoumaran) and its homologues from phenoxyacetic acid, A., i, 94.
- Stoermer, Richard**, and *K. Behn*, synthesis of aromatic alcohols by means of formaldehyde, A., i, 726.
- Stoermer, Richard**, and *Johannes Boes*, presence of homologous coumarones in coal-tar, A., i, 31.
- Stoermer, Richard**, and *G. Calov*, coumarilic acid and its derivatives, A., i, 336.
- Stoermer, Richard**, and *Bruno Kahlert*, hydrolysis of phenol ethers by alcoholic potash, A., i, 533.
- production of *o*-hydroxyphenylethyl alcohol from coumarone and synthesis of hydrocoumarone, A., i, 535.
- Stokes, Henry N.** See *William Francis Hillebrand*.
- Stoklasa, Julius**, nutrition of sugar beet, A., ii, 528.
- Stoklasa, Julius**, and *J. Pitra*, influence of potassium salts on the development of barley, A., ii, 621.
- Stokvis, C. S.** See *R. H. Saltet*.
- Stolle, Ferdinand**, octabenzoylraffinose, A., i, 189.
- refraction of aqueous carbohydrate solutions. I. Mutarotating sugars (hexoses), A., i, 368.
- refraction of aqueous carbohydrate solutions. II. Mutarotating sugars (disaccharides) and non-mutarotating sugars, A., i, 507.

- Stolle, Ferdinand**, researches on caramel.
 IV. Decomposition products of caramel, A., i, 673.
 — [sulphides in] bone black, A., ii, 154.
 — volumetric estimation of invert sugar, A., ii, 286.
- Stollé, Robert**, formation of secondary s-acid hydrazides, A., i, 316.
 — acetals of *p*-diketohexamethylene, A., i, 390.
- Storer, Francis Humphreys**, search for other sugars than xylose and dextrose in the products of the hydrolysis of wood from the trunks of trees, A., i, 67.
- Stradomsky, N.**, formation of oxalic acid in the human body, A., ii, 404.
- Strasburger, Josef**, estimation of carbohydrates in human faeces, A., ii, 357.
- Strauss, Eduard**, 2:1-aminopropanol and 2:3-aminobutanol, A., i, 17.
- Strauss, Eduard**. See also **Karl A. Hofmann**.
- Streathfield, Frederick William, and J. Davies**, an improved melting point apparatus, A., ii, 302.
- Streathfield, Frederick William**. See also **Raphael Meldola**.
- Strecker, Wilhelm**. See **J. Precht**.
- Street, John Phillips**, reduction of nitrates in presence of farmyard manure, A., ii, 329.
 — estimation of the availability of organic nitrogen in commercial fertilisers, A., ii, 531.
- Strehl, Hans, and Otto Weiss**, physiology of the suprarenal capsules, A., ii, 612.
- Striebel, A.** See **René Thomas-Mamert**.
- Strobel, Max**. See **Julius Schmidt**.
- Strüver, Giovanni**, chemical action between dry hauerite and various metals at the ordinary temperature, A., ii, 317.
- Strutt, R. J.**, tendency of the atomic weights to approximate to whole numbers, A., ii, 308.
- Strzyzowski, Casimir**. See **Bruna Galli-Valerio**.
- Stuchlik, Leo**, papaverinol, A., i, 41.
- Study, E.**, invariant theory for chemists, A., ii, 497.
- Stull, W. N.**, [precipitation of zinc and cadmium by hydrogen sulphide in acid solution], A., ii, 625.
- Stutzer, Albert**, behaviour of denitrifying bacteria in culture solutions, A., ii, 264.
 — morphology of the organisms designated "*Bacterium radicicola*," A., ii, 265.
 — assimilation of carbon dioxide by hyphomicrobium and nitromicrobium, A., ii, 267.
- Stutzer, Albert**, chemical investigation of soil samples from German East Africa, A., ii, 283.
- Suchy, R.**, pyrogenic Daniell cells, A., ii, 369.
- Sudborough, John Joseph**, additive compounds of α - and β -naphthylamine with trinitro-derivatives of benzene, T., 522; P., 1901. 44.
 — acetylation of arylamines, T., 533; P., 1901, 45.
 — nomenclature of the acid esters of unsymmetrical dicarboxylic acids, P., 1901, 43.
 — note on diphenyldinitroethylene, P., 1901, 68.
- Sulc, Ottokar**, solubility of mercury haloid salts, and especially of mercuric iodide, in organic solvents, A., ii, 101.
- Suler, Ber**, electrolytic reduction of nitrites, A., ii, 637.
- Sundvik, Ernst Edward**, psylla wax, psyllostearyl alcohol, and psyllostearic acid (psylla alcohol and psyllic acid), III, A., i, 358.
- Sustschinsky, P. von**, celestite from Marienstein, Bavaria, A., ii, 605.
- Sutherland, William**, molecular constitution of water, A., ii, 92.
- Suzuki, U.**, occurrence of organic iron compounds in plants, A., ii, 678.
 — tea plant, A., ii, 679.
 — localisation of theine in tea leaves, A., ii, 680.
- Svedmark E.**, [berzelianite from] the Skrickerum Mine [Sweden], A., ii, 604.
- Swain, Robert E.**, formation of allantoin from uric acid in the body, A., ii, 610.
- Swaving, A. J.**, influence of the season and feeding on the Reichert-Meissl number of Dutch butter, A., ii, 587.
- Syers, H. W.** See **Eduard C. Cyril Baly**.
- Szél, Ladislaus von**, rapid estimation of phosphoric acid soluble in water in superphosphates, A., ii, 476.
- Szolayski, Bogdan**. See **Eugen Bamberger**.

T.

- T., J.**, estimation of manganese in ferrochromium alloys, A., ii, 283.
- Täuber, Ernst**, glycerol monosalicylate, A., i, 538.
- Täuber, Ernst, and Franz Walder**, Bismarck-brown, A., i, 41.
- Tafel, Julius**, hydrouracil, A., i, 194.
 — products of the reduction of uric acid, A., i, 236.
 — products of the reduction of methylated uric acids, A., i, 237.
 — tetrahydrouric acid, A., i, 426.

- Tafel, *Julius*, and *Beano Ach*, electrolytic reduction of xanthine, A., i, 425.
 ——— reduction products of guanine, A., i, 426.
- Tafel, *Julius*, and *Arthur Weinschenk*, electrolytic reduction of methyluracil, A., i, 71.
 ——— electrolytic reduction of barbituric acid, A., i, 72.
 ——— 4-methyldeoxyxanthine and deoxyheteroxanthine, A., i, 106.
- Tagiuri, *C. C.* See *Arturo Miolati*.
- Tailleur, *P.* a glucoside characterising the germinating period of beech, A., ii, 466.
- Talbot, *Henry Paul*. See *Johannes Wislicenus*.
- Talief, *Konstantin*, methylbutylallyl-carbinolse containing normal and secondary butyl, A., i, 250.
- Tambon, detection of sesamé oil in vegetable and animal oils, A., ii, 360.
- Tambor, *Josf.* See *Stanislaus von Kostanecki*.
- Tammann, *Gustar*, so-called liquid crystals, A., ii, 231.
- Tanatar, *Simeon M.*, combustion of gases, A., ii, 13, 228.
 ——— perborates, A., ii, 314.
 ——— lead suboxide, A., ii, 451.
 ——— cadmium suboxide, A., ii, 553.
 ——— bismuth suboxide, A., ii, 553.
- Tarbouriech, *J.*, action of mercaptan on quinones, A., i, 329.
- Tarbouriech, *J.* See also *A. Astruc*.
- Tarible, *Joseph*, combination of boron bromide with phosphorus chlorides, A., ii, 153.
 ——— action of boron bromide on the phosphorus iodides and the haloids of arsenic and antimony, A., ii, 153.
- Tarnuzzer, *Chr.*, *Gustav Nussberger*, and *P. Lorenz*, metalliferous deposits of Canton Grisons, A., ii, 319.
- Tarugi, *N.*, dichlorohydroxybenzoic acids, A., i, 146.
- Tarugi, *N.*, and *Giuseppe Bombardini*, dilute solutions, A., ii, 89.
- Taylor, *A. Ernest*, vapour pressure relations in mixtures of two liquids, III., A., ii, 7.
- Teeple, *J. E.* See *William Ridgely Orndorff*.
- Telle, *Fernand*, titration of salicylic acid, salicylates, and phenol, A., ii, 357.
 ——— titration of phenol, salicylic acid, and salol in surgical dressings, A., ii, 698.
- Teller, *F.* See *Daniel Vorländer*.
- Tervet, *John N.* See *John Theodore Hewitt*.
- Testoni, *Giuseppe*, crystalline compounds in galanga root, A., i, 92.
- Testoni, *Giuseppe*, and *L. Mascarelli*, action of nitric acid on acetylene, A., i, 494.
- Testoni, *Giuseppe*. See also *A. Conti*.
- Tétry, *Léon*. See *Louis Bouveault*.
- Thatcher, *R. W.*, indirect weighing of quantitative precipitates; rapid and accurate method for determining the weight of a precipitate without separating it from the liquid, A., ii, 685.
- Thatcher, *R. W.* See also *R. S. Hiltner*.
- Thebaud, *E. D.* See *William Ridgely Orndorff*.
- Thesmar, *G.* See *Emilio Nölting*.
- Theuer, *Franz*. See *Josf Herzig*.
- Theulier, *Eugène*, citraptene or lemon camphor, A., i, 218.
 ——— essential oil of female rose wood, A., i, 396.
 ——— essential oil of vetiver, A., i, 397.
- Thevénot, *G.* See *August Michaelis*.
- Thibault, *Paul*, new bismuth salicylate, A., i, 593, 712.
 ——— hydrated bismuth oxide, A., ii, 106.
- Thiel, *A.* See *Friedrich Wilhelm Küster*.
- Thiele, *Edmund*, constitution of, and action of aqueous ammonia on sodium cellulose, A., i, 634.
 ——— new form of burette A., ii, 575.
- Thiele, *F. C.*, modification of Kipp's apparatus, A., ii, 516.
- Thiele, *Johannes*, condensation products of indene, A., i, 76.
 ——— cyclopentadiene dibromides, A., i, 181.
 ——— derivatives of cyclopentadiene, A., i, 182.
- Thiele, *Johannes*, and *Richard Escales*, condensation products of 2:4-dinitrotoluene, A., i, 689.
- Thiele, *Johannes*, and *Karl Jaeger*, derivatives of hydroxyquinol, A., i, 701.
 ——— dihydroxyfluorescein, A., i, 723.
- Thierfelder, *Hans*. See *Emil Wörner*.
- Thiesen, *Max*, and *Karl Scheel*, vapour tension of water at temperatures between -12° and 25° , especially at 0° , A., ii, 86.
- Thomas, *Pierre*, nitrogenous nutrition of yeast, A., ii, 617.
- Thomas, *Victor*, the chemistry of methylene, A., i, 357.
 ——— thallium chlorobromides, A., ii, 60, 100, 159, 507.
- Thomas-Mamert, *René*, and *A. Striebel*, condensation of ethyl cetipate with *o*-diamines, II., A., i, 614.

- Thompson, William Henry**, diuretic effects of sodium chloride, A., ii, 30.
- Thoms, Hermann**, and **R. Beckstroem**, constituents of calamus oil, A., i, 396.
- Thoms, Hermann**, and **Georg Fendler**, undecenoic acid, A., i, 186.
- distillation of castor oil, A., i, 252.
- Thoms, Hermann**, and **M. Wentzel**, bases in mandragora roots, A., i, 405.
- Thomson, Arved**, cultivated plants and organic nitrogen compounds, A., ii, 620.
- Thomson, William**, and **James Porter Shenton**, detection of arsenic in beers, brewing materials, and food, A., ii, 345.
- Thorpe, Jocelyn Field**. See **William Henry Perkin, jun.**
- Thorpe, Thomas Edward**, presidential address, T., 871; P., 1901, 70.
- Thorpe, Thomas Edward**, and **John Holmes**, the occurrence of paraffins in the leaf of tobacco, T., 982; P., 1901, 170.
- Thorpe, Thomas Edward**, and **Charles Simmonds**, lead silicates in relation to pottery manufacture, T., 791; P., 1901, 113; discussion, P., 114.
- Thresh, John Clough**, estimation of phenol when mixed with resinous substances, A., ii, 698.
- Thugutt, Stanislaus Joseph**, zeagonite as a new alteration product of nephelite, A., ii, 112.
- Tiemann, [Johann Karl Wilhelm] Ferdinand**, [with **Max Kerschbaum**, and **Hermann Tigges**], the two campholytic acids and lauronic acid, A., i, 5.
- Tiemann, Ferdinand**, [with **Georg Lemme**, and **Max Kerschbaum**], peculiar disruption of the camphor ring, A., i, 18.
- Tiemann, Ferdinand**, [with **R. Schmidt**], compounds of the cyclocitral series, A., i, 157.
- inversion of compounds belonging to the citral series, A., i, 157.
- cyclocitral, A., i, 158.
- constitution of α -ionone, A., i, 159.
- Tiemann, Ferdinand**, [with **Hermann Tigges**], constitution of β -camphornitrilic acid, A., i, 19.
- constitution of α -cyclogeranic acid, A., i, 158.
- Tiesenholt, W. von**, action of hypochlorous acid on metallic chlorides, A., ii, 154.
- Tiffeneau**. See **Auguste Béal**.
- Tigges, Hermann**. See **Ferdinand Tiemann**.
- Tillinghast, J. A.** See **Homer J. Wheeler**.
- Tingle, Alfred**, synthesis of amines by the aid of alkyl salicylates, A., i, 200.
- Tingle, John Bishop**, camphoroxalic acid derivatives, VI., A., i, 632.
- Tingle, John Bishop**, and **Leo O'Byrne**, action of phenols on ethylic oxalate, A., i, 533.
- Tissier, and Victor Grignard**, action of acid chlorides and anhydrides on the organometallic compounds of magnesium, A., i, 316.
- organometallic compounds of magnesium, A., i, 316.
- organic magnesium compounds of the benzene series, A., i, 440.
- Tissot**. See **Auguste Chauveau**.
- Titherley, Arthur Walsh**, the preparation of substituted amides from the corresponding sodamides, T., 391; P., 1901, 29.
- a new method of preparing diacetamide, T., 411; P., 1901, 31.
- note on two molecular compounds of acetamide, T., 413; P., 1901, 31.
- Tocher, James F.**, volumetric estimation of phenol, A., ii, 353.
- Tollens, Bernhard**, cellulose, oxycellulose, hydrocellulose, the pectins, and tragacanth, A., i, 453.
- spectral reactions of blood in presence of formaldehyde, A., i, 492.
- Tollens, Bernhard**. See also **J. J. Murumow**, **Kintaro Oshima**, and **A. Schöne**.
- Tolloczko, Stanislaw**, cryoscopic investigations with inorganic solvents, A., ii, 437.
- Tolloczko, Stanislaw**. See also **Ludwik Bruner**.
- Tolman, L. M., L. S. Munson**, and **W. D. Bigelow**, composition of jellies and jams, A., ii, 588.
- Tomarchio, G.** See **Giuseppe Grassi-Cristaldi**.
- Tombeck, Daniel**, compounds of metallic salts with aromatic amines, A., i, 135.
- compounds of metallic salts with bases of the pyridine series, A., i, 164.
- compounds of cupric salts with organic bases, A., i, 266.
- Torrey, Joseph, jun.**, and **Otis Fisher Black**, derivatives of α -nitro- β -dinitropropionaldehyde, A., i, 11.
- Tortelli, Massimo**, and **A. Pergami**, mean molecular weight of the fixed (insoluble) acids of fats, A., ii, 358.
- Tortelli, Massimo**, and **R. Ruggeri**, oil and fat of *Stillingia sebifera*, A., ii, 34.
- absolute iodine absorption number of fats, A., ii, 47.

- Töth, Julius**, estimation of nicotine in tobaccos or tobacco extracts, A., ii, 363, 708.
- Townsend, John S.**, diffusion of ions produced in air by the action of a radio-active substance, ultra-violet light, and point discharges, A., ii, 3.
- conductivity produced in gases by the motion of negatively charged ions, A., ii, 221.
- Townsend, John S.**, and **P. J. Kirkby**, conductivity produced in hydrogen and carbon dioxide by the motion of negatively charged ions, A., ii, 434.
- Trabut**, the manna of olives, A., ii, 184.
- Traube, Wilhelm**, synthesis of uric acid, xanthine, theobromine, theophylline, and caffeine from cyanoacetic acid, A., i, 54.
- cyclic carbamides [pyrimidines], A., i, 762.
- Traube, Wilhelm**, and **Erich Lehmann**, behaviour of alkylene oxides towards ethyl malonate and ethyl acetoacetate, A., i, 501.
- Travers, Morris William**, liquefaction of hydrogen, A., ii, 379.
- Travers, Morris William**. See also **William Ramsay**.
- Treadwell, Frederick Pearson**, and **G. H. Kramers**, separation of zinc from nickel and cobalt, A., ii, 281.
- Treadwell, Frederick Pearson**, and **E. Vogt**, Vogel's method for the detection of cobalt, A., ii, 284.
- Trechmann, Charles O.**, a British occurrence of mirabilite, A., ii, 396.
- Treibich, A.** See **Wilhelm Lossen**.
- Trener, Giovanni Battista**, action of phenylhydrazine on aldol and on crotonaldehyde, A., i, 232.
- Trillat, J. Auguste**, oxidation of primary alcohols by contact-action, A., i, 441.
- contact-action and the secondary and tertiary alcohols, A., i, 496.
- Trillat, J. Auguste**. See also **L. Alphonse Adrian**.
- Trischler, F.** See **Friedrich Krafft**.
- Tröger, Julius**, and **Erich Ewers**, arylthiolsulphonates and arylsulphinites of diazo-compounds, A., i, 171.
- Tröger, Julius**, and **Otto Linde**, arylthiolsulphonates of organic bases, A., i, 337.
- Trouton, Frederick T.**, latent heat of evaporation of steam from saturated salt solutions, A., ii, 592.
- Trowbridge, John**, spectra of hydrogen, and some of its compounds, A., ii, 633.
- Truchon, R.**, and **Martin-Claude**, composition of certain fruit juices used in the preparation of confectionery, syrups, &c., A., ii, 363.
- Truchot, P.**, analysis of commercial copper, A., ii, 197.
- Tscherne, Rudolf**, condensations of the ester of isonicotinic acid, A., i, 749.
- Tschirch, [Wilhelm Oswald] Alexander**, and **Ed. Brüning**, the resin-balsam of *Picea vulgaris*, Link (Jura turpentine), A., i, 91.
- the resin balsam of *Pinus Pinaster* (Bordeaux turpentine), A., i, 220.
- Tschirch, Alexander**, and **E. Faber**, formation of resin in several Abietes, A., i, 601.
- Tschirch, Alexander**, and **J. Klaveness**, Natal aloes, A., i, 399.
- Uganda aloes, A., i, 602.
- Tschirch, Alexander**, and **H. Kritzler**, microchemical examination of aleurone-grains, A., ii, 33.
- Tschirch, Alexander**, and **B. Niederstadt**, the resin of *Pinus sylvestris*, A., i, 397.
- New Zealand kauri copal from *Dammara australis*, A., i, 398.
- Tschitschibabin, A. E.**, action of benzyl chloride and iodide on pyridine, A., i, 484.
- preparation of simple and compound anhydrides, A., i, 536.
- Tschugaeff, L.**, thujene, a new dicyclic terpene, A., i, 38.
- conversion of thujylamine into thujene, A., i, 601.
- triboluminescence, A., ii, 489.
- Tsvett, M.**, blue chlorophyllin, A., i, 94.
- metachlorophyllins and the plurality of chlorophyllins, A., i, 222.
- apparatus for the observation of fluorescence and opalescence, A., ii, 298.
- Tucker, Samuel Auchmuty**, and **Herbert R. Moody**, the production of some new metallic borides, P., 1901, 129.
- electrolysis of calcium chloride with reference to the formation of chlorate, A., ii, 98.
- improved electric furnace for laboratory use, A., ii, 596.
- comparison of the solubility of acetylene and ethylene, A., ii, 696.
- Türin, Vl. von**, extent to which the interaction of ionic charges diminishes the osmotic pressure, A., ii, 375.
- Tunnicliffe, Francis W.**, and **Otto Rosenheim**, influence of boric acid and borax on metabolism in children, A., ii, 517.

- Tunnicliffe, Francis W.**, and **Otto Rosenheim**, influence of formaldehyde on the metabolism of children, A., ii, 517.
- Turner, Alfred John**. See **John Theodore Hewitt**.
- Turner, B. Bernard**, dielectric constants of pure liquids, A., ii, 53.
- Turner, H. J.** See **Ira Remsen**.
- Tutton, Alfred Edwin**, comparative crystallographical study of the double selenates of the series $R_2M(SeO_4)_2 \cdot 6H_2O$.—Salts in which M is magnesium, A., ii, 546.
- Tutwiller, C. C.**, estimation of hydrogen sulphide in illuminating gas, A., ii, 421.
- Tyrer, Thomas**, and **Chas. T. Tyrer**, comparison of the quantitative action to reducing agents on mercury and bismuth salts, A., ii, 693.

U.

- Uhl**, and **Otto Henzold**, detection of alcohol in milk, A., ii, 425.
- Uhlenhuth**, a method of distinguishing varieties of blood, A., ii, 325.
- Ullmann, Fritz**, and **Jean Bielecki**, syntheses in the diphenyl series, A., i, 586.
- Ullmann, Fritz**, and **A. Fornaro**, preparation of phosphorus oxychloride, A., ii, 551.
- Ullmann, Fritz**, and **G. Pasdermadjian**, new synthesis of aromatic sulphones, A., i, 383.
- Ulpiani, C.**, optical activity of lecithin, A., i, 491, 498.
- Ulpiani, C.** See also **G. Ampola**.
- Umbgrove, Herm.** See **Albin Haller**.
- Underhill, F. P.** See **Lafayette B. Mendel**.
- Urbain, G.** and **E.**, isolation of yttria, ytterbia, and neo-erbia, A., ii, 160.
- Urbain, K.**, elimination of methane from the atmosphere, A., ii, 273.
- Urban, K.** See **Karl Andrlík**.
- Utz, F.**, impregnation and analysis of antiseptic dressing materials, A., ii, 131.
- estimation of sugar by Fehling's solution, A., ii, 205.
- volumetric estimation of mercuric chloride in surgical dressings, A., ii, 348.
- detection of boiled and unboiled milk, A., ii, 428.
- Baudouin's reaction for the detection of sesamé oil, and Tambon's modification of the test, A., ii, 483.

V.

- Vagt, A.** See **Arthur Hantzsch**.
- Vaillant, G.**, the colour of ions, A., ii, 595.
- Valenta, Eduard**. See **Georg von Georgievics**.
- Valentine, William**. See **Henry Lord Wheeler**.
- Valeur, Amand**, thermochemistry of quinones: constitution of quinhydrones, A., i, 154.
- action of the esters of dibasic acids on organometallic compounds, A., i, 317.
- Vallée, C.**, action of acids on carbonates of the alkaline earth metals in presence of alcohol, A., ii, 239.
- Vandergrift, G. W.**, and **William J. Gies**, composition of elastic tissue, A., ii, 461.
- Vandervyver-Grau**, determination of the specific heat of fats, A., ii, 46.
- Vandevelde, Alb. J. J.**, Breinl's reaction for sesamé oil, A., ii, 48.
- Vanino, Ludwig**, action of formaldehyde solution on calcium carbide, A., i, 125.
- behaviour of aqueous formaldehyde towards gun-cotton, A., i, 372.
- Vanino, Ludwig**, and **Otto Hauser**, compounds of bismuth chloride with organic bases, A., i, 289.
- Vaubel, Wilhelm**, Millon's reaction, A., i, 28.
- substance formed in the iodination of phenols, A., i, 143.
- carbazole, A., i, 652.
- action of alcoholic silver nitrate on aromatic bases, A., i, 691.
- molecular weight of indigo-blue and of indigo-red, A., i, 714.
- new hydro-compound of indigotin and its application to quantitative estimation, A., i, 715.
- iodine and the colour of iodine solutions, A., ii, 446.
- the bromination and iodination numbers of proteids, A., ii, 709.
- Veley, Victor Herbert**, and **J. J. Mauley**, some physical properties of nitric acid solutions, A., ii, 447.
- Velich, Al.**, feeding with molasses and molasses-foods, A., ii, 529.
- Venturi, G. Antonio**, benzylcarvacrol and benzyl-m-cresol, A., i, 590.
- Vereinigte Chininfabriken Zimmer & Co.**, preparation of mixed carbonates of the cinchona alkaloids and the mono- and di-hydric phenols, A., i, 738.
- quinine and cinchonidine chloro-carbonates, A., i, 739.

- Vereinigte Chininfabriken Zimmer & Co.**, preparation of quinine and cinchonidine alkyl carbonates, A., i, 739.
- Verley, Albert**, aryl hydrogen sulphates, A., i, 143.
- Vernadsky, W.**, theory of silicates, A., ii, 249.
- Verneuil, Auguste [Victor Louis]**, secondary products of the action of sulphuric acid on wood charcoal, A., i, 546.
- Vernon, Horace Middleton**, action of trypsin on fibrin, A., i, 576.
- pancreatic rennin and diastase, A., ii, 710.
- Verwer, Hans**, formation of carbon during the electrolysis of ammonium oxalate, A., ii, 693.
- Vêzes, Maurice**, complex salts of platinum. (IV.) Oxalonitrites of the alkaline earth metals, A., i, 187.
- Victor, Ernest**, estimation of cyanides and cyanates, A., ii, 623.
- Vieth, Paul**, and **Moritz Siegfeld**, acidity of milk, A., ii, 46.
- Vignon, Léo**, cellulose, hydrocellulose, mercerised and precipitated cellulose, A., i, 16.
- Vignon, Léo**, and **F. Coutourier**, variation in the amounts of gluten in wheat, A., ii, 335.
- Vignon, Léo**, and **F. Gerin**, nitromannitol and nitrocellulose, A., i, 662.
- Ville, Jules**, and **Joseph Moitessier**, "organic chlorine" in the urine, A., ii, 565.
- Villiger, Victor**. See **Adolf von Baeyer**.
- Vincent, Swale**, and **Thomas Lewis**, proteids of unstriped muscle, A., ii, 255.
- chemistry and heat rigor curves of voluntary and involuntary vertebrate muscle, A., ii, 460.
- Viola, Carlo**, glaucescence of felspars, A., ii, 320.
- Vischner, Emil**. See **Max Bamberger**.
- Visser, A. W.** See **Ernst Cohen**.
- Vitali, Dioscoride**, recognition of barium compounds as the cause of poisoning, A., ii, 39.
- the constituents of Digitalis and their toxicological detection, A., ii, 50.
- chemico-toxicological investigation of bromoform and of bromal, A., ii, 480, 534.
- oxidising ferment contained in pus, A., ii, 672.
- Vivian, Alfred**, comparison of reagents for milk proteids with some notes on the Kjeldahl method for nitrogen determination, A., ii, 363.
- Vivian, Alfred**. See also **S. Moulton Babcock**.
- Voedisich, O. W.** See **Moses Gomberg**.
- Voegelen, E.** See **Arthur Hantzsch**.
- Voelcker, John Augustus**, [pot experiments on the action of sodium iodide and bromide, and lithium chloride on crops], A., ii, 269.
- [pot experiments on wheat and barley], A., ii, 270.
- use of sodium nitrate containing perchlorate, A., ii, 270.
- gorse as food for sheep, A., ii, 271.
- Vogel**. See **Max Gerlach**.
- Vogel, Curt von**, condensation of isodialuric acid with thiocarbamide, A., i, 262.
- Vogt, E.** See **Frederick Pearson Treadwell**.
- Vogt, Johan H. L.**, separation of titaniferous iron-ores in basic igneous rocks, A., ii, 63, 319.
- Voit, Erwin**, the need for energy in animals during inanition, A., ii, 254.
- proteid katabolism in inanition, A., ii, 459.
- Volhard, Franz**, the fat-splitting ferment of the stomach, A., ii, 518.
- Volhard, Jakob**, potassium thiocyanate as indicator in the reduction of ferric salts, A., ii, 580.
- Volland, Hans**. See **Hans Stobbe**.
- Volney, C. W.**, decomposition of sodium nitrate by sulphuric acid, II., A., ii, 600.
- Vongerichten, Eduard**, apiin, A., i, 40.
- thebenidine, A., i, 341.
- morphidine, A., i, 405.
- apiin and apiose, A., i, 646.
- preparation of morphenol, A., i, 742.
- Voorhees, E. B.**, investigations relative to the use of nitrogenous materials [as manures], A., ii, 341.
- Vorländer, Daniel**, addition of ketomethane derivatives to unsaturated compounds, A., i, 84.
- constitutional formulæ of acids, A., i, 444.
- oxidation of compounds containing nitrogen, A., i, 454.
- Vorländer, Daniel**, and **E. Drescher**, [with **F. Teller**], acyl derivatives of indoxyl and of indoxyllic acid, A., i, 563.
- Vorländer, Daniel**, and **W. Meusel**, esters of acylphenylglycine-*o*-carboxylic acids, A., i, 83.
- Vorländer, Daniel**, and **Erich Mumme**, anilodiacetic-*o*-carboxylic acid, A., i, 83.
- oxidation of arylaminodiacetic acids, A., i, 463.
- Vorländer, Daniel**, and **Rudolf von Schilling**, action of nitrous acid on *o*-toluidinodiacetic acid, A., i, 463.

- Vorländer, Daniel**, [and, in part, *Rudolf von Schilling*, and *M. Schrödter*], oxidation of nitrous acid and nitrosoamines, A., i, 462.
- Vorländer, Daniel**, and *M. Schrödter*, action of hydrogen chloride of nitroso-o-tolylglycine, A., i, 463.
- Vorländer, Daniel**, and *Philipp Schubart*, constitution of indigo-carmin, A., i, 564.
- Voss, U.** See *August Michaelis*.
- Voswinkel, Hugo**, triazan derivatives, A., i, 53, 617.
- Votoček, Emil**, rhodose, a methylpentose from convolvulin, A., i, 368.
- Votoček, Emil**, and *V. Frič*, sugars of xanthorhammin and quercitrin, A., i, 161.
- Vries, J. J. Ott de**, and *F. W. J. Boekhout*, curdling by rennet, A., ii, 258.
- Vries, K. de**, artificial manures and humus, A., ii, 684.
- Vulté, Hermann T.**, and *Harriet Winfield Gibson*, nature and properties of corn oil [maize oil]. II. Determination of the constitution, A., ii, 360.
- Vulté, Hermann T.**, and *Lily Logan*, a comparison between the bromine and iodine absorption figures of various oils, A., ii, 430.
- W.**
- Waals, Johannes Diderik van der**, relation between the temperature changes of the specific volumes of liquid and saturated vapour, A., ii, 305.
- the equation of condition and the theory of cyclic motion, A., ii, 644.
- Wacker, Leonhard**, α -azoxynaphthalene, A., i, 655.
- Wagner, Georg, jun.**, methylisopropylallylcarbinol, A., i, 182.
- Wagner, Hermann**. See *Carl Bülow*.
- Wagner, Julius**, classification of acid and alkali indicators, A., ii, 419.
- Wagner, Paul**, [preservation of farm-yard manure], A., ii, 530.
- Wahl, André R.**, direct nitration in the aliphatic series, A., i, 310.
- dimethylpyruvic acid, A., i, 364.
- ethyl nitroacetate, A., i, 445.
- action of fuming nitric acid on substituted acrylic acids, A., i, 663.
- Wahl, André R.** See also *Louis Bouveault*.
- Walbaum, Heinrich**, neroli oil, A., i, 39, 733.
- Walden, Paul**, inorganic solvents and dissociation media, A., ii, 11.
- Walder, Franz**. See *Ernst Täuber*.
- Waldvogel**, alkalinity of the blood, A., ii, 116.
- Waljaschko**. See *Ernst Schmidt*.
- Walker, C.** See *William Henry Perkin, jun.*
- Walker, James**, nomenclature of the ions, A., ii, 636.
- Walker, James**, and *John S. Lumsden*, the hydrobromides of undecylenic acid, T., 1191; P., 1901, 188.
- *n*-decanedicarboxylic acid, T., 1197; P., 1901, 188.
- Walker, Percy H.**, volumetric estimation of zinc, A., ii, 625.
- Walko, Karl**, reduction and action of aromatic nitro-compounds [in the animal organism], A., ii, 669.
- Wallach, Jean**. See *W. Feuerstein*.
- Wallach, Otto**, [and, in part, *van Beeck-Vollenhoven*, *Leimbach*, *Julius Sal-kind*, and *Nicolai Speranski*], terpenes and ethereal oils; A., i, 155.
- Wallach, Otto**, [and, in part, *H. and E. Lauffer*, *Alfred Schäfer*, and *Wilhelm Rojahn*], terpenes and ethereal oils, A., i, 89.
- Wallach, Otto**, [with *Edgar Neumann*, and *Wilhelm von Westphalen*], terpenes and ethereal oils; studies in the feuchone series, A., i, 331.
- Walland, Heinrich**. See *Friedrich Emich*.
- Walter, Johann**, condensation products of aromatic aldehydes with primary aromatic amines and their sulphonic acids, A., i, 694.
- Walther, J.**, valuation of lemon oil, A., ii, 49.
- estimation of carvone in ethereal oils, A., ii, 49.
- Warfel, R. R.** See *William Albert Noyes*.
- Warren, Charles Hyde**, anorthite crystals from Franklin furnace, New Jersey, A., ii, 455.
- Warren, F. W.** See *Arthur Bower Griffiths*.
- Washington, Henry S.**, chemical study of the glaucophane schists, A., ii, 172.
- Wassilieff, Nicolai J.**, nitrogenous constituents of the seeds and seedlings of *Lupinus albus*, A., ii, 185.
- Watschjanz, A.** See *Carl Adam Bischoff*.
- Watson, Chalmers**, metabolism in gout, A., ii, 68.
- Wauters, P.** See *Alph. van Engelen*.
- Webel, Franz**. See *Stanislaus von Kostanecki*.
- Weber, C.** See *Adolph Emmerling*.
- Wechsler, Elkan**. See *Raphaël Meldola*.

- Wedekind, Edgar**, action of formaldehyde on menthol, A., i, 393.
 — preparation of acid anhydrides by the aid of tertiary amines, A., i, 499.
 — behaviour of tertiary bases towards methyl bromomalonate, A., i, 504.
 — limits of combination in tertiary amines, A., i, 639.
 — chloromethyl menthyl oxide, A., i, 731.
 — model of the nitrogen atom demonstrating the stereoisomerism of the oximes, A., ii, 596.
- Wedekind, Edgar**, and **J. Haeussermann**, action of benzoyl chloride on ethyl ether, A., i, 536.
- Wedell-Wedellsborg, P. S.**, Poynting's theorem, A., ii, 82.
- Weed, Walter Harvey**, granite rocks of Butte, Montana [analyses of biotite and hornblende], A., ii, 65.
 — enrichment of mineral veins by later metallic sulphides, A., ii, 108.
- Wegener, Friedrich**, intramolecular rearrangement of isoaldoxime ethers, A., i, 152.
- Wegscheider, Rudolf**, esterification of 3-nitrophthalic acid, A., i, 325.
 — most general form of the laws of chemical kinetics for homogeneous systems, A., ii, 57.
 — relations between constitution and reactive power, A., ii, 229.
 — decomposition of ammonium nitrite, A., ii, 384.
- Wegscheider, Rudolf**, and **Alfred Lipschitz**, esterification of unsymmetrical di- and poly-basic acids. III. Esterification of 3- and 4-nitrophthalic acid, A., i, 32.
- Wehrbein, K.** See **Augustin Bistrzycki**.
- Weidmann, Samuel**, micropertthite from Wisconsin, A., ii, 170.
- Weigert, Fritz**. See **Jacobus Henricus van't Hoff**.
- Weigmann, H.**, and **Otto Henzold**, influence of feeding on [the composition of] butter, A., ii, 187.
- Weil, Hugo**, coloured rosaniline bases, A., i, 100.
- Weil, Ludwig**, saponins and their distribution, A., i, 648.
- Weil, Richard**, formation of solanine in potatoes as a product of bacterial action, A., ii, 266.
- Weinland, Ernst**, formation of glycogen after feeding on galactose, A., ii, 29.
 — lactase of the pancreas, A., ii, 30.
 — gastric digestion in selachian fishes, A., ii, 252.
 — glycogen in parasitic worms, A., ii, 258.
- Weinland, Ernst**, gastric digestion in elasmobranchs, A., ii, 458.
- Weinland, Rudolph F.**, and **G. Kappeller**, addition of hydrogen fluoride to salts of ethyl sulphuric acid and certain sulphonic acids, A., i, 309.
- Weinland, Rudolph F.**, and **P. Lehmann**, action of sodium ethoxide and alkalis on arsenic pentasulphide, A., ii, 313.
- Weinland, Rudolph F.**, and **Hugo Prause**, compounds of telluric acid with iodates, phosphates, and arsenates, A., ii, 599.
- Weinland, Rudolph F.**, and **Fr. Schlegelmilch**, double salts of antimony pentachloride, A., ii, 660.
- Weinland, Rudolph F.**, and **H. Stille**, replacement of oxygen by fluorine in the iodoxy-compounds, A., i, 684.
- Weinschenk, Arthur**, condensation of barbituric acid with aromatic aldehydes to coloured substances, A., i, 528.
 — condensation of acetone and carbamide, A., i, 583.
- Weinschenk, Arthur**. See also **Julius Tafel**.
- Weinschenk, Ernst**, colours of minerals, A., ii, 167.
- Weis, Fr.**, a proteolytic and rennet-like ferment in malt, A., ii, 69.
- Weis, Fr.** See also **Wilhelm Johannsen**.
- Weiss, A.** See **Max Guthzeit**.
- Weiss, Maurus**. See **Carl D. Harries**.
- Weiss, Otto**. See **Hans Strehl**.
- Weissgerber, Rudolf**, a potassium derivative of fluorene, A., i, 521.
- Weissgerber, Rudolf**. See also **Gustav Kraemer**.
- Wells, Horace Lemuel**, purification of caesium material, A., ii, 652.
 — caesium periodate and iodate-periodate, A., ii, 653.
- Wells, Horace Lemuel, H. P. Beardsley, G. S. Jamieson**, and **F. J. Metzger**, double nitrates, A., ii, 653.
- Wells, Horace Lemuel**, and **F. J. Metzger**, caesium antimonious fluorides and other double haloids of antimony, A., ii, 514.
 — — separation of tungstic and silicic acids, A., ii, 534.
 — — acid nitrates, A., ii, 652.
 — — salt of quadrivalent antimony, A., ii, 661.
- Wells, Horace Lemuel**, and **J. M. Willis**, caesium tellurium fluoride, A., ii, 652.
 — — double chlorides of caesium and thorium, A., ii, 660.
- Welmans, Paul**, estimation of fat in finely powdered substances, particularly in cocoa and cocoa mixtures, A., ii, 47.
 — oleum cacao, A., ii, 207.

- Welmans, Paul**, detection of tragacanth and dextrin in cocoa and chocolate and approximate estimation of dextrin by polarisation, A., ii, 288.
- Wengraf, P.** See *Josef Herzig*.
- Went, F. A. F. C.**, influence of nutrition on the secretion of enzymes by *Monilia sitophila*, A., ii, 411.
- *Monilia sitophila*, a technical mould from Java, A., ii, 676.
- Wentzel, M.** See *Hermann Thoms*.
- Wenzel, Franz.** See *Josef Herzig*, and *Felix Kaufler*.
- Wenzel, G.**, action of halogens and carbon disulphide on sodium methylene compounds, A., i, 402.
- Werder, J.**, testing of bees wax, A., ii, 139.
- Werenskiold, Fr. H.**, analyses of Norwegian barley, A., ii, 336.
- Werner, Alfred**, stereoisomeric cobalt compounds, A., i, 510.
- 1:6-chloronitritodiethylenediamine-cobalt salts, $(\text{CoEn}_2\text{Cl}\cdot\text{NO}_2)_X$, A., i, 512.
- acetylacetone compounds of platinum, A., i, 682.
- Werner, Alfred**, and *K. Dinklage*, nitrilo-pentachloro-osmates and the constitution of α -mimic acid, A., ii, 661.
- Werner, Alfred**, and *L. Gerb*, 1:2-chloronitritodiethylenediamine-cobalt compounds, A., i, 512.
- Werner, Alfred**, and *Al. Gubser*, hydrated chromium chlorides, A., ii, 453.
- Werner, Alfred**, and *Ch. Herty*, constitution of inorganic compounds, A., ii, 638.
- Werner, Alfred**, and *Ed. Humphrey*, stereoisomeric dinitritodiethylenediamine-cobalt salts, $[\text{CoEn}_2(\text{NO}_2)_2]_X$, A., i, 511.
- Werner, Alfred**, and *J. Kunz*, phenanthrylamines, A., i, 696.
- Werner, Friedrich.** See *Emerich Granichstädten*.
- Werschow, S.** See *Carl Adam Bischoff*.
- Wertheimer, Émile**, properties of pancreatic juice in starving animals, A., ii, 324.
- Wessely, Leo**, action of potassium hydroxide on β -hydroxy- $\alpha\alpha$ -dimethylpropaldehyde (an analogue of Cannizzaro's reaction in the aliphatic series), A., i, 256.
- Westphalen, Wilhelm von.** See *Otto Wallach*.
- Wetzel, J.**, an improvement on the Geissler potash apparatus, A., ii, 74.
- Wetzke, Th.**, the furfuraldehyde reaction in brandy testing, A., ii, 285.
- Wewiński, L.**, condensation of glyoxal and benzaldehyde with ammonia, A., i, 353.
- Weyl, Theodor**, action of ozone on substances containing sulphur and on sulphur, A., ii, 311.
- Wharton, Frederick Malcolm.** See *Percy Faraday Frankland*.
- Wheeler, Alvin S.** See *Henry Barker Hill*.
- Wheeler, Henry Lord**, thionrea-amidines, A., i, 487.
- Wheeler, Henry Lord**, [and, in part, *Bayard Barnes*, and *William Valentine*], additive reactions of thiol acids, A., i, 636.
- Wheeler, Henry Lord**, and *Guy K. Dustin*, molecular rearrangement of disubstituted thioncarbamie esters; phenyliminothiocarbonic acid derivatives and thiosemicarbazidic esters, A., i, 24.
- Wheeler, Henry Lord**, and *Treat B. Johnson*, acetyl- and benzoyl-iminodithiocarbonic esters, A., i, 705.
- Wheeler, Henry Lord**, and *Henry F. Merriam*, action of alkyl thiocyanates and alkyl isothiocyanates [thiocarbimides] with thiol acids, A., i, 514.
- Wheeler, Homer J.**, and *Burt L. Hartwell*, apparatus for estimating fat, A., ii, 586.
- Wheeler, Homer J.**, and *J. A. Tillinghast*, effectiveness of potassium nitrate as compared with like amounts of nitrogen and potassium in the form of potassium chloride and sodium nitrate, A., ii, 340.
- White, Alfred H.**, oxidation of nitrogen as a source of error in the estimation of nitrogen and methane, A., ii, 622.
- White, John, Zeiss'** butyro-refractometer, A., ii, 207.
- White, W. Hale**, and *E. I. Spriggs*, metabolism in forced feeding, A., ii, 28, 253.
- Whiteley, C. E.** See *Julius Berend Cohen*.
- Whitney, Milton**, and *Thomas H. Means*, alkali soils of the Yellowstone Valley, A., ii, 73.
- Whittaker, C. Meredith.** See *Franz Sachs*.
- Wibbens, H.**, and *H. E. Huizenga*, digestibility of butter and its substitutes, A., ii, 253.
- Wichelhaus, [Karl] Hermann**, explosiveness of diazobenzenesulphonic acid, A., i, 241.
- Wierzchowski, Wilhelm**, decomposition of cocaine and atropine in the animal organism, A., ii, 615.

- Wiedermann, *Fritz*. See *Carl Liebermann*.
- Wiener, *E.*, mud from the salt mines of Ischl, A., ii, 114.
- Wildermann, *Meyer*, velocity of reaction before complete equilibrium and before the point of transition, &c. Part I., A., ii, 544.
- Wiley, *Harvey Washington*, sunflower plant, A., ii, 336.
- Wilhelms, *O.* See *Wilhelm Manchot*.
- Wilke, *W.* See *Friedrich Krafft*.
- Wilkinson, *E. J.* See *Arthur George Perkin*.
- Willenz, *M.*, estimation of lead in galena, A., ii, 196.
- Willgerodt, [*Heinrich*] *Conrad* [*Christoph*], and *Siegfried Jablonski*, 3-phenyl- and 3-methyl-4 : 7-quinolino-2-carboxylic acids and their derivatives, A., i, 50.
- Willgerodt, *Conrad*, and *Erwin von Neander*, 9-phenyl-4 : 10-quinolino-7-carboxylic acid and 9-methyl-4 : 10-quinolino-7-carboxylic acid, A., i, 51.
- Williams, *C. B.*, Kilgore's modification of the volumetric method of estimating phosphoric acid, A., ii, 344.
- Willis, *J. M.* See *Horace Lemuel Wells*.
- Willstätter, *Richard*, synthesis of tropidine, A., i, 223.
- synthesis of tropilidene, A., i, 649.
- synthesis of monocyclic tropine bases, A., i, 650.
- synthesis of tropan and tropidine, A., i, 650.
- oxidation of conhydrin, A., i, 739.
- conversion of tropidine into tropine, A., i, 744.
- Willstätter, *Richard*, and *Adolf Bode*, eegonic acid, A., i, 291.
- — conversion of tropinone into *r*-cocaine, A., i, 482.
- Willstätter, *Richard*, and *Charles Hollander*, synthesis of eegonic acid, A., i, 561.
- Willstätter, *Richard*, and *Rudolf Lesing*, formation of a hydrocarbon, $C_{12}H_{16}$, from quinitol, A., i, 265.
- Wilsmore, *N. T. M.*, electrode potentials, A., ii, 2.
- Wilsmore, *N. T. M.*, and *Wilhelm Ostwald*, electrode potentials and absolute potentials, A., ii, 142.
- Wilson, *C. T. R.*, ionisation of atmospheric air, A., ii, 435.
- Wilson, *F. D.* See *Arthur Michael*.
- Wilson, *Harold A.*, electrical conductivity of air and salt vapours, A., ii, 490.
- Wilson, *Harold A.* See also *Jacobus Henricus van't Hoff*.
- Wilson, *Leonard Philip*. See *Henry Edward Armstrong*.
- Wimmenauer, *Karl*, electrolytic estimation of bismuth, A., ii, 424.
- Wind, *C. H.*, irregularities of the cadmium standard cell, A., ii, 368.
- Windisch, *Karl*, changes in the fat during the ripening of cheese, A., ii, 188.
- Windisch, *Richard*, action of formaldehyde on germination, A., ii, 466.
- Winkelblech, *K.*, amphoteric electrolytes and internal salts, A., ii, 370.
- Winkelmann, *Adolf* [*August*], vapour pressure of a series of benzene compounds, A., ii, 57.
- diffusion of hydrogen through palladium, A., ii, 646.
- Winkler, *Clemens* [*Alexander*], inorganic chemistry and physical chemistry, A., ii, 232.
- Winkler, *Ferdinand*. See *Adolf Jolles*.
- Winkler, *Ludwig Wilhelm*, analysis of mixtures of two salts, A., ii, 129.
- estimation of calcium and magnesium in natural waters, A., ii, 347.
- solubility of gases in water, III., A., ii, 446.
- value of the correction for the mercury meniscus, A., ii, 574.
- [improvements in the] estimation of ammonia and nitric and nitrous acids in drinking waters, A., ii, 627.
- estimation of sulphuric acid in natural waters, A., ii, 628.
- estimation of the dissolved gases in natural waters, A., ii, 696.
- Winteler, *F.*, solubility of alkali chlorides and chlorates, A., ii, 96.
- Winter, *W.* See *Stanislaus von Kosta-necki*.
- Winterstein, *Ernst*, nitrogenous constituents of green leaves, A., ii, 619.
- Winterstein, *Fritz*. See *Victor Löwy*.
- Wintgen, *M.*, alkaloids of *Chelidonium majus*, A., i, 743.
- Wintrebert, *L.*, osmyloxalates, A., i, 313.
- Wirthle, *F.*, detection of "saccharin" (*o*-benzoic sulphinide) in wine and beer free from salicylic acid, A., ii, 135.
- detection and estimation of morphine, A., ii, 362.
- detection of "saccharin," A., ii, 704.
- Wisinger, *Oscar*, derivatives of catechol, A., i, 205.
- Wislicenus, *Heinrich*, apparatus and procedure for exact incineration, A., ii, 622.

- Wislicenus, Johannes**, the geometrically isomeric symmetrical dimethylethyl-enes (ψ -butylenes), their bromo-derivatives, and β -bromomonocarboxylic acids, A., i, 1.
- Wislicenus, Johannes**, and **Martin Henze**, geometrically isomeric α -methyl- β -crotonic acids, A., i, 4.
- Wislicenus, Johannes**, [and **Moritz-Jahrmarkt**], isostilbene, A., i, 265.
- Wislicenus, Johannes**, [with **Kurt Peters**, **Otto Schramm**, and **Otto Mohr**], 2 : 5-dimethyl-1:1-di- and -1-mono-carboxylic acids of cyclopentane, A., i, 664.
- Wislicenus, Johannes**, and **Paul Schmidt**, derivatives of ψ -butylene dibromide and crotonylene hydrobromide, A., i, 1.
- Wislicenus, Johannes**, **Henry Paul Talbot**, and **Martin Henze**, geometrically isomeric symmetrical dimethylethyl-enes [ψ -butylenes] from tiglic and angelic acids, A., i, 2.
- Wislicenus, Wilhelm**, and **Willi Binde-mann**, formylacetic esters, A., i, 361.
- Wislicenus, Wilhelm**, and **Heinrich Körber**, wandering of acyl groups, A., i, 187.
- Wislicenus, Wilhelm**, and **Charles L. Wolff**, geometrically isomeric derivatives of ethereal formylpropionates, A., i, 500.
- Wissell, Ludwig von**, [estimation of nitrogen in saltpetre], A., ii, 125.
- Withers, W. A.**, and **George S. Fraps**, rate of nitrification of some fertilisers, A., ii, 523.
- Witt, Hugo**, constitution of water, A., ii, 498.
- Witt, Otto Nikolaus**, and **Franz Schneider**, α -naphthol ethyl ether and its derivatives, A., i, 698.
- Wittich, E.**, and **B. Neumann**, a new cadmium mineral, A., ii, 663.
- Wittich, E.** See also **B. Neumann**.
- Wittmann, Carl**, quantity of pentosans contained in fruits and vegetables, A., ii, 414.
- Witz, Rudolf**. See **Arthur Hantzsch**.
- Wöhler, Lothar**. See **K. von Kraatz-Koschlan**.
- Wörner, Emil**, and **Hans Thierfelder**, chemical composition of the brain tissue, A., i, 176.
- Wogrinz, Alfred**, condensation of isovaleraldehyde with acetaldehyde, A., i, 254.
- Wohl, Alfred**, and **W. Aue**, interaction of nitrobenzene and aniline in presence of alkalis, A., i, 612.
- Wohl, Alfred**, and **Carl Neuberg**, glycer-aldehyde, A., i, 12.
- Wohl, Alfred**, and **Carl Oesterlin**, conversion of tartaric acid into oxalacetic acid by the removal of water at low temperatures, A., i, 365.
- Wohl, Alfred**, [with **K. Schäfer**, and **M. Wohlberg**], aminoacetals and amino-aldehydes, A., i, 513.
- Wohlgemuth, Julius**. See **Ferdinand Blumenthal**, and **Carl Neuberg**.
- Wohltmann, Ferdinand**, experiments with German, English, and French mangels, A., ii, 573.
- Wolff, A.** See **Oscar Doeblner**.
- Wolff, Charles L.** See **Wilhelm Wislicenus**.
- Wolff, Jules**, presence of methyl alcohol in the fermented juice of several fruits, A., i, 110.
- solubility of some metallic oxides in sodium and ammonium salicylate, A., ii, 198.
- analysis of chicory root, A., ii, 295.
- sodium ferrisalicylate; estimation of boric acid in borates of the alkalis and alkaline earths, A., ii, 346.
- Wolff, L. K.** See **A. Smits**.
- Wolff, Ludwig**, production of methyl-succinic acid from pyruvic acid, A., i, 499.
- Wolff, Ludwig**, [with **M. Gabler**, and **W. Schimpff**], condensation products of tetronic acid, A., i, 283.
- Wolff, Ludwig**, [with **Willy Herold**], new condensation product from pyruvic acid, A., i, 502.
- Wolfenstein, Eduard**. See **Richard Wolfenstein**.
- Wolfenstein, Richard**, and **G. Bumcke**, cellulose, A., i, 582.
- Wolfenstein, Richard**, and **Friedrich Groll**, hydroxylamine hydriodide, A., ii, 551.
- Wolfenstein, Richard**, and **Eduard Wolfenstein**, relation between chemical constitution and physiological action in the piperidine series, A., ii, 566.
- Wolfenstein, Richard**. See also **Martin Auerbach**, **W. Hohenemser**, **P. Kattwinkel**, **Leonard Mamlock**, and **Arthur Marcuse**.
- Wolfs, H.** See **Paul Behrend**.
- Woll, Fritz Wilhelm August**, composition of sow's milk, A., ii, 338.
- Wolowski, C.**, estimation of indican in urine and its clinical significance, A., ii, 293.
- Wolpert, E.** See **Max Busch**.
- Woodman, A. G.**, and **L. L. Cayvan**, estimation of phosphates in potable waters, A., ii, 344.

Woringer, Benedikt, vapour pressure of a series of benzene compounds, A., ii, 87.

— rotation dispersion of malic acid, A., ii, 214.

— a new laboratory barometer with automatic zero adjustment, A., ii, 648.

Woy, [Ernst Friedrich] Rudolf, Kjeldahl's method of sugar estimation, A., ii, 286.

— estimation of phosphoric acid in wines by the official method, A., ii, 344.

Wragg, Ernest. See **Siegfried Ruhemann**.

Wrampelmeyer, Eduard, Halphen's reaction for cotton seed oil, A., ii, 207.

Wrewsky, M. S., vapour pressures of aqueous alcoholic salt solutions, A., ii, 56.

Wright, Hamilton, action of chloroform and ether on the neurons of rabbits and dogs, A., ii, 180.

— action of chloroform and ether on the nerve-cells of dogs, A., ii, 408.

Wróblewski, Augustin, method of obtaining crystals in a solution without formation of superficial crust, A., ii, 90.

— dialysis in certain liquids in which india-rubber, but not parchment, swells up, A., ii, 307.

— influence of phosphates on the fermentative action of yeast extract: complex phosphoric acids and the rôle of phosphoric acid in animated nature, A., ii, 328.

— yeast extract, A., ii, 465.

— Buchner's yeast extract, A., ii, 616.

Wrochem, J. von. See **Rudolf Dietz**.

Wülfing, Ernst Anton, crystallographic constants and chemical composition of tourmaline, A., ii, 65.

— chemical and mineralogical constituents of kenper marl, A., ii, 113.

Wynne, William Palmer, the chlorination of toluene, P., 1901, 116.

Wyrouboff, Grégoire N., oxalates, A., i, 7.

— chromium oxalate, A., i, 579.

— rubidium racemate, A., i, 666.

— researches on solutions, A., ii, 149.

— metathorium, A., ii, 604.

Y.

Yates, J. See **William Henry Perkin, jun.**, and **Alexander William Gilbody**.

Young, George, and **William Eyre**, oxidation of benzatthiosemicarbazone, T., 54; P., 1900, 188.

Young, George, and **William Henry Oates**, contribution to the chemistry of the triazoles. 1-Methyl-5-hydroxytriazoles, T., 659; P., 1901, 86; discussion, P., 87.

Young, Stewart W., studies on solutions of tin salts. I. Electrical conductivity of solutions of stannous chloride and hydrochloric acid, A., ii, 318.

— studies on solutions of stannous salts. II. The oxidation of solutions of stannous chloride by means of free oxygen, A., ii, 390.

— electrically heated and electrically controlled thermostat, A., ii, 491.

— studies on solutions of stannous salts, III., A., ii, 603.

Young, Sydney, experiments on fractional distillation, A., ii, 86.

Young, Sydney. See also **J. Rose-Innes**.

Z.

Zahn, O. See **Oscar Kellner**.

Zaky, Aly, influence of lecithin on urinary constituents, A., ii, 673.

Zaky, Aly. See also **H. Claude**, and **Alexandre Desgrez**.

Zaleski, J. See **Marcellus Nencki**.

Zaleski, W., formation of proteids in plants, A., ii, 619.

Zambonini, Ferruccio, forsterite from Latium: diopside from Siberia, A., ii, 396.

— müllerite, melite, and schrotterite, A., ii, 397.

— a sodiferous pyroxene from the neighbourhood of Öropa in the Biellesi, A., ii, 398.

— a mineral from Casal Brunori near Rome, A., ii, 560.

— analysis of pyrosmalite, A., ii, 607.

Zawidzki, Jan von, vapour pressure of binary liquid mixtures, A., ii, 6.

Zega, Alexander, *Hibiscus esculentus*, A., ii, 70.

— testing flour, A., ii, 583.

— testing marc and plum brandies, A., ii, 697.

Zega, Alexander, and **Dobr. Knez-Miloković**, water chestnut (*Trapa natans*, L.), A., ii, 269.

— beans as food material in Servia, A., ii, 468.

Zehrlant, Heribert, electrolysis of phenol in presence of hydrogen haloid, A., i, 382.

Zeitschel, Otto. See **Albert Hesse**, and **Hans Stobbe**.

Zelikoff, J. See **Nicolai D. Zelinsky**.

- Zelinsky, Nicolai D.**, synthesis of tertiary cyclicalcohols by the aid of magnesium-alkyllaloids, A., i, 660.
— hexamethylene [*cyclohexane*], A., i, 683.
- Zelinsky, Nicolai D.**, and **J. Zelikoff**, trimethyltrimethylenes, A., i, 657.
- Zemjatschensky, Petr A.**, laumontite from the Caucasus, A., ii, 607.
- Zengelis, Constantin**, theory of chemical catalysis, A., ii, 151.
— volumetric estimation of iron and tin by means of stannous chloride, A., ii, 533.
- Zerner, Theodor.** See **Hugo Koch**.
- Zernoff, Wladimir**, iodination by means of chloride and bromide of iodine, A., i, 185.
- Zielstorff, W.** See **C. Fruwirth**.
- Zimmer & Co.** See **Vereinigte Chininfabriken**.
- Zimmermann, Robert.** See **Franz Kunc-kell**.
- Zincke, [Ernst Carl] Theodor**, quinols, A., i, 204.
— action of nitric acid on halogen derivatives of *p*-cresol, A., i, 330.
— action of hypochlorous acid on diazobenzenesulphonic acid, A., i, 778.
- Zincke, Theodor**, and **P. Drost**, nitro-derivatives of *o*-dinitrosotoluene and *o*-dinitrosoxylylene, A., i, 73.
- Zincke, Theodor**, and **E. Petermann**, ketochlorides and quinones of phenyl-aziminobenzene [phenylbenzotriazole], A., i, 104.
- Znatowicz, B.**, action of silver nitrite on aromatic halogen-substituted compounds, A., i, 319.
- Zopf, Wilhelm**, compounds from lichens, VII., A., i, 87, 546.
— polycystin, a crystalline carotin from *Polycystis flos aque*, A., i, 283.
- Zschimmer, Eberhard**, analysis of Italian crude boric acid, A., ii, 194.
- Zulkowski, Karl**, constitution of andalusite and of disthene, A., ii, 169.
- Zumbusch, Leo R. von**, bilifuscin, A., i, 283.
- Zuntz, Nathan**, metabolism in horses, A., ii, 177.
— importance of various foods as sources of muscular energy, A., ii, 254.
- Zuntz, Nathan**, and **S. Kostin**, detection of carbon monoxide in the air, A., ii, 280.

INDEX OF SUBJECTS.

ABSTRACTS. 1901. Parts I. & II.

(Marked A. i and A. ii respectively); and also to Transactions, 1901 (marked T.); and to Proceedings of the Session 1900—1901; Nos. 227 to 240, Nov., 1900—June, 1901 (marked P.).

A.

- Abietes**, formation of resin in several (TSCHIRCH and FABER), A., i, 601.
- Abies alba***, occurrence of maltol in the needles of (FEUERSTEIN), A., ii, 526.
- Absorption** in the intestine (HÜBER), A., ii, 610.
in the small and large intestines (REACH), A., ii, 667.
in the liver (BÜRGER), A., ii, 178.
of fat (PFLÜGER), A., ii, 29, 562; (MUNK), A., ii, 176; (ROSENBERG), A., ii, 403.
of artificially coloured fats (HOFBAUER; EXNER; PFLÜGER), A., ii, 403.
of maltose (REID), A., ii, 458.
of oxygen by yeast (HARDEN and ROWLAND), T., 1231; P., 1901, 189.
of water (BARCROFT), A., ii, 28.
- Absorptive power** of dilute solutions of salts of the alkali metals for ammonia (DAWSON and McCRAE), T., 493; P., 1901, 5.
of dilute solutions of salts of the alkaline earth metals for ammonia (DAWSON and McCRAE), T., 1069; P., 1901, 177.
- Accipenserine**, a new protamine (KURAEFF), A., ii, 462.
- Accumulators**. See Electrochemistry.
- Acenaphthalene** and **Acenaphthene**, refraction and dispersion of (PELLINI), A., ii, 365.
- Acet-**. See also Aceto-, Acetyl-, and under the Parent Substance.
- Acetaldehyde** in green leaves (REINKE and BRAUNMÜLLER), A., ii, 332.
- Acetaldehyde**, condensation of. with α -hydroxyisobutaldehyde (ROESLER), A., i, 669.
action of, on *o*-toluidine (EIBNER and PELTZER), A., i, 97.
condensation of, with isovaleraldehyde (WOGGINZ), A., i, 254.
quinol- and resorcinol-carbohydrazones (EINHORN and ESCALES), A., i, 653.
- Acetaldoxime**, action of alkyl iodides on (DUNSTAN and GOULDING), T., 635; P., 1901, 84.
- Acetals** (DELÉPINE), A., i, 3, 669; ii, 6.
formation and decomposition of (DELÉPINE), A., i, 254.
and their isomerides, heats of formation of (DELÉPINE), A., i, 314.
action of alcohols on (DELÉPINE), A., i, 365.
- Acetamide**, action of acetic and benzoic chlorides on (TITHERLEY), T., 411; P., 1901, 31.
sodium, action of alkyl iodides, acid chlorides and bromoamides on (TITHERLEY), T., 392; P., 1901, 29.
sodium bromide and iodide (TITHERLEY), T., 413; P., 1901, 31.
- Acetamide**, cyano-, condensation of, with chloroform, and action of, on ethyl ethoxymethyleneacetoacetate (ERRERA), A., i, 43.
- Acetamides**, alkyl substituted, and their hydrochlorides and sodium derivatives, preparation of (TITHERLEY), T., 400; P., 1901, 30.
- Acetanilide**, alkylation of (LANDER), T., 691; P., 1901, 60.
chlorination of (CHATTAWAY and ORTON), T., 469; P., 1901, 39.

- Acetanilide**, colour reaction of, with potassium permanganate (MAAS), A., ii, 210.
 detection of, in urine (PETERMANN), A., ii, 485.
- Acetanilide**, 2:5- and 4-3-chlorobromo- (CHATTAWAY and ORTON), T., 466; P., 1901, 39.
 chlorodibromo- and dichlorobromo-derivatives of (HURTLEY), T., 1295; P., 1901, 192.
 isomeric chlorobromo-derivatives of (CHATTAWAY and ORTON), T., 816; P., 1901, 124.
o-chloro-*p*-nitro-, and *p*-chloro-*o*- and -*m*-nitro- (CHATTAWAY, ORTON, and EVANS), A., i, 24.
o-, *m*-, and *p*-nitro-, substituted nitro-gen bromides and chlorides from (CHATTAWAY, ORTON, and EVANS), A., i, 23.
- Acetanilides**, chloro-, action of potassium hydrosulphide, cyanide and thiocyanate on (GROTHER), A., i, 79.
 action of potassium thiocyanate on (FRERICHS and BECKURTS), A., i, 80.
- Acetic acid** hydrobromide perbromide (v. BAeyer and VILLIGER), A., i, 659.
 detection of, in urine (LIPLIAWSKY), A., ii, 428.
 estimation of (DELFINO and MIRANDA), A., ii, 45.
- Acetic acid**, manganic salt (CHRISTENSEN), A., ii, 512.
- Acetic acid**, β -acetyl ethyl and propionyl-methyl esters (VAN REYMEYNT), A., i, 126.
 benzoyl-*o*- and -*m*-tolyl esters (BARTOLOTTI), A., i, 37.
 $\beta\beta\beta$ -trichloro- α -bromo- and - α -iodo-ethyl esters (GABUTTI and BARGELINI), A., i, 366.
 ethyl ester, influence of non-electrolytes on the rate of hydrolysis of (KULLGREN), A., ii, 496.
 compound of, with triphenylmethyl (GOMBERG), A., i, 638.
 iodoethyl ester (HENRY), A., i, 577.
 2:4:6-triiodophenol ester (BRENANS), A., i, 643.
 methyl ester, rate of hydrolysis of (COPPADORO), A., ii, 544; (HENRI and BANCELS), A., ii, 647.
- Acetic acid**, amino-. See Glycine.
 bromo-, ethyl ester, action of, on silver nitrite (SCHOLL and SCHÖFER), A., i, 359.
 chloro-, action of, on *p*-toluidine (STÉPPES), A., i, 139.
- Acetic acid**, trichloro-, molecular volume of, in organic solvents (CARRARA and LEVI), A., ii, 4.
 cyano-, synthesis of caffeine, theobromine, theophylline, uric acid, and xanthine from (TRAUBE), A., i, 54.
 phenylhydrazone, and the action of sodium and hydroxylamine on the ethyl ester (BERTINI), A., i, 775.
 ethyl ester, condensation of, with acetone (KOMPPA), A., i, 114.
 condensation of, with aldehydes (BERTINI), A., i, 537.
 action of, on ketones (GUARESCHI), A., i, 341; (PEANO), A., i, 346.
 action of halogens on the sodium derivative of (ERRERA and PERCIABOSCO), A., i, 18.
 action of halogens and carbon disulphide on the sodium derivative of (WENZEL), A., i, 402.
 esters, action of formic esters on (DE BOLLEMONT), A., i, 116, 117.
 haloids, esters, action of, on tertiary bases (WEDEKIND), A., i, 639.
 nitro-, ethyl ester (BOUVEAULT and WAHL), A., i, 5; (WAHL), A., i, 445.
 thio-, additive reactions of (EIBNER), A., i, 321.
 action of alkyl thiocyanates and alkylthiocarbimides on (WHEELER and MERRIAM), A., i, 514.
 thiocyno-, phenyl ester (WHEELER and JOHNSON), A., i, 706.
- Acetic butyric anhydride** (AUTENRIETH), A., i, 186.
- Acetic chloride**, compound of, with aluminium chloride, and its interaction with benzene (BOESEKEN), A., i, 474.
- Acetic thiocyanate**, action of, on ethyl phenyl- thiol-, and -thion-carbazinate (WHEELER and DUSTIN), A., i, 25.
- Aceto-**. See also under Parent Substance.
- Acetoacetic acid**, ethyl ester, mechanism of the formation of (REFORMATSKY), A., i, 447.
 product of nitration of (BOUVEAULT and BONGERT), A., i, 579.
 fluorylhydrazone (DIELS), A., i, 522.
 sodium derivative, syntheses with (MICHAEL), A., i, 123.
 methyl and ethyl esters, transformation of *O*-acyl derivatives of, into the isomeric *C*-acyl derivatives (CLAISEN and HAASE), A., i, 118; (WISLICENUS and KÖRBER), A., i, 187.

- Acetoacetic acid**, methyl ester, sodium derivative, action of butyryl chloride on (BOUVEAULT and BONGERT), A., i, 311.
- Acetoaceticglycine**, diethyl ester (FISCHER), A., i, 192.
- 4-Acetoacetylpyridine** and its anilide, mono-oxime and platinumchloride (TSCHERNE), A., i, 749.
- Acetol**. See Acetylcarbinol.
- Acetone**, equilibrium between water, phenol and (SCHREINEMAKERS), A., ii, 445.
solidification of (FORMENTI), A., i, 13.
condensation of, with carbamide (WEINSCHENK), A., i, 583.
condensation of, with ethyl cyanoacetate (KOMPPA), A., i, 114.
action of hypophosphorous acid on (MARIE), A., i, 635.
formation of, from albumin, and detection of (BLUMENTHAL and NEUBERG), A., i, 433.
influence of diet on the separation of (SCHUMANN-LECLERCQ), A., ii, 463.
new reaction of (STERNBERG), A., ii, 587.
estimation of, gasometrically, in urine (RIEGLER), A., ii, 361.
- Acetonebutyrylhydrazone** (BONGERT), A., i, 410.
- Acetonedicarboxylic acid**, ethyl ester, action of, on aniline (BESTHORN and GARBEN), A., i, 78.
action of, on *m*-phenylenediamine (BESTHORN and GARBEN), A., i, 97.
compounds of, with diazo-compounds, and their decomposition products (BÜLOW and HÖPFNER), A., i, 239.
and mono- and di-anilides (BESTHORN and GARBEN), A., i, 78.
- Acetonedicarboxylic acid**, cyano-, ethyl ester, properties of alkyl derivatives of, and the methyl ester (DERÔME), A., i, 313.
- Aceto- α - and - β -naphthalides**, alkylation of (LANDER), T., 697; P., 1901, 59.
- Acetonitrile** as a catalytic reagent (MICHAEL), A., i, 457.
- Acetonylacetone**, physical constants of, and action of mineral acids and alkalis on (GRAY), T., 681; P., 1901, 89.
condensation of, with hydrazine hydrate (GRAY), T., 682; P., 1901, 90.
- Acetonylisocamphor** and its disemicarbazone, phenylhydrazones, and imide (DUDEN and HEYNSIUS), A., i, 748.
- Acetonylpropylidenebistetronic acid**, and its benzoyl derivative and oxime, (WOLFF and GÄBLER), A., i, 285.
- Acetophenone** catechol-, resorcinol-, and quinol-carbohydrazones (EINHORN and ESCALES), A., i, 652.
selenium derivatives of (KUNCKELL and ZIMMERMANN), A., i, 214.
- Acetophenone**, *o*-amino-, compound of, with ethyl oxalate (CAMPS), A., i, 751.
bromo-, action of, on sodioacetylacetone (MARCH), A., i, 596.
bromo- and chloro-, iodine derivatives of (COLLET), A., i, 35.
m-cyano- (RUPE and V. MAJEWSKI), A., i, 104.
- Acetophenoneaminophenylguanidine** nitrate and picrate (PELLIZZARI and RICKARDS), A., i, 770.
- Acetophenonedisulphone**. See Diethyl-disulphone- α -phenylethane.
- Acetophenoneoxime**, action of alkyl iodides on (DUNSTAN and GOULDING), T., 637; P., 1901, 84.
- Acetophenoneoximes**, ω -chloro- and ω -bromo-derivatives, and *m*-nitro- of the bromo-compound, and their acetyl derivatives (KORTEN and SCHOLL), A., i, 549.
- Acetophenone- β -*o*-, -*m*-, and -*p*-phenylbenzimidazole hydrazones** (MIKLASZEWSKI and V. NIEMENTOWSKI), A., i, 762.
- Acetophenonepinacolone** from alcohol and acetophenone (CIAMICIAN and SILBER), A., i, 36.
- Aceto-*o*- and -*p*-toluidides**, alkylation of (LANDER), T., 693; P., 1901, 59.
- Acetoxime**, action of alkyl iodides on, in presence of sodium methoxide (DUNSTAN and GOULDING), T., 630; P., 1901, 84.
- o*-**Acetoxybenzoic acid**. See Aspirin.
- 1-Acetoxy-2-benzoylcamphene** (FORSTER), T., 1002.
- Acetoxyethylideneacetone** (PAULY and V. BERG), A., i, 506.
- Acetoxymethylfurfural** (FENTON and GOSTLING), T., 810; P., 1901, 119.
- α -Acetoxy- α -propoxy- $\beta\beta\beta$ -trichloroethane** (GABUCCI), A., i, 367.
- p*-Acetoxytriphenylacetyl acetate** (BISTRZYCKI and NOWAKOWSKI), A., i, 717.
- Acetyl-**. See also under Parent Substance.
- p*-Acetylacetanilide**, selenium derivative of (KUNCKELL and ZIMMERMANN), A., i, 215.
- Acetylacetone**, action of hydrogen sulphide on (LETEUR), A., i, 581.

- Acetylacetone** sodium derivative, action of, on bromoacetophenone (MARCH), A., i, 596.
 platinum compounds of, and their potassium and sodium salts (WERNER), A., i, 682.
- Acetylacetoneglycine**, ethyl ester (FISCHER), A., i, 192.
- Acetylamidrazone** and its benzylidene and methylene derivatives (BAMBERGER and GROB), A., i, 292.
- 5-*p*-Acetylaminoanilino-7-methylnaphthaphenazonium-3-sulphonic acid**, 9-chloro- (KEHRMANN and MÜLLER), A., i, 420.
- m*-Acetylamino benzenesulphonic acid**, salts (GNEHM and SCHEUTZ), A., i, 519.
- o*-Acetylamino benzoic acid**, ethyl ester (MEHNER), A., i, 645.
 4- and 6-chloro- (COHN), A., i, 637.
- Acetylamino benzyl chlorides** (KÜHN), A., i, 42.
- Acetylamino benzyl piperidines**, *o*-, *m*-, and *p*- (KÜHN), A., i, 42.
- 7 (or 4)-Acetylamino-2:4 (or -2:7)-dimethylbenziminazole** (PINNOW), A., i, 412.
- 4-Acetylamino-1:3-dimethylbenziminazalone-5-carboxylic acid** (PINNOW), A., i, 413.
- m*-Acetylamino dimethyl-*p*-toluidine**, *o*-nitro-, and its methiodide (PINNOW), A., i, 412.
- 4'-Acetylamino diphenylamine**, 3-chloro-6-nitro- (KEHRMANN and KRAZLER), A., i, 420.
- Acetylamino ethoxyacetophenone** and nitro- (KUNCKELL), A., i, 214.
- Acetylamino hydroxyacetophenone** and its oxime, phenylhydrazone, and nitro- and α -chloro-derivatives (KUNCKELL), A., i, 213.
- 3-Acetylamino-5-methoxy-7-phenylnaphthaphenazonium methyl sulphate** (KEHRMANN and SILBERSTEIN), A., i, 103.
- 5-Acetylamino-1:2-naphthaquinone** and -2-naphthol and its 1-amino- and nitroso-derivatives (KEHRMANN and DENK), A., i, 89.
- 2-Acetylamino phenol**, 4:6-dinitro- (MELDOLA and WECHSLER), P., 1900, 180.
- 5-Acetylamino phenonaphthoxazone** and 2-nitro- (KEHRMANN and BACHE), A., i, 47.
- o*-Acetylamino phenylhydroxy-quinoxaline** and -methylquinoxaline (MARCHLEWSKI and BURACZEWSKI), A., i, 347.
- 5-Acetylamino phenylnaphthaphenazonium salts**, 6-chloro- (KEHRMANN and BACHE), A., i, 48.
- Acetyl-*o*-aminophenylpropionic acid**, ethyl ester (CAMPS), A., i, 751.
- 5-Acetylamino phenylrosinduline salts** and an iminazole derivative (KEHRMANN and BACHE), A., i, 48.
- α -Acetylamino propionic acid** and its ethyl esters, amide, ammonium salt, hydrochloride and nitrate (DE JONG), A., i, 130.
- 3-Acetylamino rosinduline salts** (KEHRMANN and SILBERSTEIN), A., i, 103.
- o*-Acetylamino-*p*-tolyl dimethylethylammonium bromide** and ***m*-Acetylamino-*p*-tolyl trimethylammonium iodide** (PINNOW), A., i, 413.
- 4-Acetylamino-1:2:5-trimethylbenziminazole** and its methiodide (PINNOW), A., i, 139, 412.
- Acetylation of arylamines** (SUDBOROUGH), T., 533; P., 1901, 45.
- Acetyl benzamide**, *p*-nitro- (RAPPEPORT), A., i, 569.
- m*-Acetyl benzoic acid** and its methyl ester (RUPE and V. MAJEWSKI), A., i, 104.
- Acetyl benzoyl hydrazoxime**, acetyl derivative, and **Acetyl benzoyl-*p*-bromophenyl hydrazoxime** (PONZIO and ROSSI), A., i, 169.
- Acetyl bromal bromide** and chloride ($\alpha\beta\beta$ -tetrabromo- and α -chloro- $\beta\beta\beta$ -tribromo-ethyl acetate) (GABUTTI), A., i, 11.
- Acetyl bromo amino-*o*-mono- and -2:6-dibromo-*p*-nitro benzene** (CHATTAWAY, ORTON, and EVANS), A., i, 24.
- Acetyl bromo amino chlorobenzenes** (CHATTAWAY and ORTON), T., 819; P., 1901, 124.
- Acetyl-bromo- and -chloro-amino-2:4-dichlorobenzenes**, action of, on amines and phenylhydrazine (CHATTAWAY and ORTON), T., 461; P., 1901, 38.
- Acetyl-bromo- and -chloro-amino chlorobenzenes** (CHATTAWAY and ORTON), T., 816; P., 1901, 124.
- Acetyl-bromo- and -chloro-amino-*o*-, -*m*-, and -*p*-nitrobenzenes** (CHATTAWAY, ORTON, and EVANS), A., i, 23.
- Acetyl carbinol (acetol)** (KLING), A., i, 625.
- 4-Acetyl catechol** and its phenylhydrazones, semicarbazone, and 4-dichloro-derivative (BRUHNS), A., i, 215.
- Acetyl chloral bromide** and iodide (GABUTTI and BARGELLINI), A., i, 366.
- Acetyl chloro amino benzene**, preparation of (CHATTAWAY and ORTON), T., 277; P., 1900, 231.
- Acetyl chloro amino bromobenzenes** (CHATTAWAY and ORTON), T., 820; P., 1901, 124.

- Acetylchloroamino-2:4-dichlorobenzene**, preparation of (CHATTAWAY and ORTON), T., 280; P., 1900, 231.
- Acetylchloroamino-*o*-mono- and -2:6-dichloro-*p*-nitrobenzene** (CHATTAWAY, ORTON, and EVANS), A., i, 21.
- Acetylchloro-dextrose and -lactose** (SKRAUP and KREMANN), A., i, 506.
- Acetylchlorogalactose** (FISCHER and ARMSTRONG), A., i, 189; (SKRAUP and KREMANN), A., i, 506.
- preparation of (RYAN and MILLS), T., 704; P., 1901, 90.
- Acetylchlorohydrose and its reduction and hydrolysis** (V. ARLT), A., i, 369.
- Acetylcoumaroneoxime** (STOERMER), A., i, 336.
- α -Acetyl- β -dimethyladipic acid**, hydrogen ethyl ester and semicarbazone (TIEMANN and TIGGES), A., i, 158.
- Acetyldioxyquinoxaline and its salts** (MANUELLI and GALLONI), A., i, 413.
- Acetyldiphenyl**, selenium derivative of (KUNCKELL and ZIMMERMANN), A., i, 215.
- Acetyldiphenylthiocarbamide**, action of bromine on, in chloroform solution, and its oxide (HUGERSHOFF and KÖNIG), A., i, 758.
- Acetylene**, production of (BONE and JERDAN), T., 1042; P., 1901, 162.
- electrochemical behaviour of (COEHN), A., ii, 539.
- decomposition of, at high temperatures (BONE and JERDAN), P., 1901, 165.
- comparison of the solubility of ethylene and (TUCKER and MOODY), A., ii, 696.
- action of, on cuprous chloride dissolved in potassium chloride (CHAVASTELON), A., i, 494.
- action of nitric acid on (TESTONI and MASCARELLI), A., i, 494.
- analysis of (ROSSEL and LANDRISET), A., ii, 202.
- estimation of phosphorus and sulphur in (EITNER and KEPPELER), A., ii, 689.
- Acetylene**, iodo-, so-called, constitution of (PERATONER and SPALLINO), A., ii, 657.
- Acetylenedicarboxylic acid**, action of bromine on (LOSSEN and TREIBICH), A., i, 632.
- Acetylenetriphenyltriamine** (SABANÉEFF and PROSIN), A., i, 695.
- Acetylenoid metallic radicles** (BERTHELOT), A., i, 494.
- 3-Acetyl-7-ethoxy-2 methylchromone** (v. KOSTANECKI and RÓŻYCKI), A., i, 223.
- 2-Acetylfurfuran** from wood-tar and its synthesis, and oxime and benzoyl derivative and semicarbazone (BOUYEAULT), A., i, 400.
- β -Acetylglutaric acid** and its ketodilactone (FITTIG and ROTH), A., i, 121.
- α -Acetylheptinene** (*acetylenanthylidene*) and the action of sulphuric acid on (MOUREU and DELANGE), A., i, 14.
- decomposition of, by alkalis (MOUREU and DELANGE), A., i, 14.
- Acetylhexoxymethane** (MOUREU and DELANGE), A., i, 14.
- Acetylimino-dithiocarbonic acid**, esters (WHEELER and JOHNSON), A., i, 705.
- Acetylmalono-anilic and -thionilic acids**, ethyl esters (BEHREND, MEYER, and BUCHHOLZ), A., i, 136.
- Acetylmesitylene**, dichloro-, and its bromo-derivatives (KUNCKELL and HILDEBRANDT), A., i, 552.
- 4-Acetylmethylamino-1-acetyl-7-methylbenzotriazole** (PINNOW), A., i, 139.
- Acetylmethylanilide**, α -chloro- and α -bromo- (BISCHOFF), A., i, 526.
- 4-chloro- (CHATTAWAY and ORTON), T., 465; P., 1901, 39.
- Acetylmethylcarbamide**, cyano- (TRAUBE), A., i, 54, 762.
- Acetylmethylcarbinol**, production of, by *Bacillus tartricus* (GRIMBERT), A., ii, 328.
- Acetylmethylenechlorohydrin** (DESCUDÉ), A., i, 504.
- Acetylmethylcyclohexanone**, constitution of, and of the acid, $C_9H_{16}O_3$, from it (LESER), A., i, 278.
- 2:3-Acetylmethylquinoxaline** (SACHS and BARSCHALL), A., i, 670.
- Acetyl- α - and - β -naphthyl-thio- and -isothio-carbamides** (HUGERSHOFF and KÖNIG), A., i, 27.
- Acetyl-*m*-nitrobenzylanilide** (PURGOTTI and MONTI), A., i, 22.
- Acetylenanthylidene**. See Acetylheptinene.
- Acetylphenyl- α -amino-trichloroethyl hydrosulphide** (EIBNER), A., i, 321.
- Acetyl-*o*-phenylenediamine** (MANUELLI and GALLONI), A., i, 413.
- Acetylphenylethylideneoxy-cyclotriazane** (VOSWINCKEL), A., i, 54.
- Acetylphenylglycine-*o*-carboxylic acid**, dimethyl and diethyl esters (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 709.
- esters (VORLÄNDER and MEUSEL), A., i, 83.

- Acetylphenyl-thio-** and **-isothio-carbamide**, action of aqueous sodium hydroxide on (HUGERSHOFF and KÖNIG), A., i, 27.
- Acetypiperone**, synthesis of (FEUERSTEIN and HEIMANN), A., i, 465.
- α -Acetylpropionic acid**, and its α -bromo- and α -chloro-derivatives and their nitriles (VAN REYMEANT), A., i, 126.
- 4-Acetylpyrogallol** and its disulphonic acid, phenylhydrazone, and 4-dichloro-derivative (BRUHNS), A., i, 215.
- Acetylthiocarbamic acid**, esters (WHEELER and MERRIAM), A., i, 514; (WHEELER and JOHNSON), A., i, 705.
- Acetylthioncarbanilic acid**, methyl ester (WHEELER and DUSTIN), A., i, 25.
- Acetyl-*o*-toluidide**, 6-chloro- (COHN), A., i, 637.
- Acetyl-*o*-** and **-*p*-tolylthiocarbamides**, action of aqueous sodium hydroxide on (HUGERSHOFF and KÖNIG), A., i, 27.
- β -Acetyltrimethylglutaric acid** and its salts and ketodilactone (FITTIG and SALOMON), A., i, 123.
- Acetyltrimethyl-lotoflavin** (DUNSTAN and HENRY), A., i, 647.
- Acetyltropic acid** (HESSE), A., i, 713.
- α -Acetyl- γ -valerolactone**, δ -chloro- (TRAUBE and LEHMANN), A., i, 502.
- Acid**, $C_3H_9O_3P$, $C_3H_9O_4P$, and $C_6H_{15}O_4P$, from the action of hypophosphorous acid on acetone (MARIE), A., i, 635.
- $C_4H_3O_3N$, from the action of nitric acid on acetylene (TESTONI and MASCARELLI), A., i, 494.
- $C_5H_7O_3N_3$, and its dimethylamine salt, from the product of nitration of ethyl acetoacetate (BOUVEAULT and BONGERT), A., i, 579.
- $C_6H_{11}O_5N$, obtained in the preparation of α -acetylaminopropionic acid (DE JONG), A., i, 131.
- $C_7H_9O_3N$, and its salts, from the oxazole, $C_9H_{13}O_3N$ (MARCH), A., i, 312.
- $C_7H_{11}O_3N_3$, and its diethylamine salt, from the product of nitration of ethyl acetoacetate (BOUVEAULT and BONGERT), A., i, 579.
- $C_7H_{12}O_4$, from the oxidation of phellandrene nitrite (WALLACH and H. and E. LAUFFER), A., i, 89.
- $C_7H_{14}O_2(?)$, from beeswax (GRESHOFF and SACK), A., i, 446.
- $C_7H_{14}O_3$, from the condensation of isovaleraldehyde and acetaldehyde (WOGRINZ), A., i, 254.
- $C_8H_8O_4$, from *Coriaria angustissima* (EASTERFIELD and ASTON), T., 123; P., 1900, 211.
- Acid**, $C_8H_{11}O_3N_3$, and its pyridine salt and urethane, from the product of nitration of ethyl acetoacetate (BOUVEAULT and BONGERT), A., i, 579.
- $C_8H_{12}O_4$, from ethyl crotonate and sodium (MICHAEL), A., i, 125.
- $C_8H_{14}O_3$, from the oxyketone, $C_9H_{16}O_2$, from *i*-terpineol (SCHIMMEL & Co.), A., i, 395.
- $C_9H_{10}O_4$, and $C_9H_{12}O_4$, from the reduction of dihydroxyapocamphoric acid (KOMPPA), A., i, 668.
- $C_9H_{14}O_4$, m. p. 192° , from the oxidation of α -campholytic acid (TIEMANN, KERSCHBAUM, and TIGGES), A., i, 6.
- $C_9H_{14}O_4$, and $C_9H_{14}O_5$, from the oxidation of tetrahydro-xylic acids (PERKIN and YATES), T., 1389.
- $C_9H_{16}O_3$, from acetyl methylcyclohexanone (LESER), A., i, 278.
- $C_9H_{16}O_3$, from the hydrolysis of campholytolactone (TIEMANN, KERSCHBAUM, and TIGGES), A., i, 5.
- $C_{10}H_8O_4$, and its salts and ethyl esters, from *o*-carboxyeinamic acid (LEUPOLD), A., i, 711.
- $C_{10}H_{12}O_2$, from the hydrolysis in the organism of an oil from the acid, $C_{10}H_{14}O_4$ (HILDEBRANDT), A., ii, 670.
- $C_{10}H_{12}O_4$, and its tetrabromide, from the hydrolysis of ethyl β -diamylsulphone- α -methylbutyrate (POSNER and CLAUDIUS), A., i, 704.
- $C_{10}H_{14}O_4$, from the hydrolysis of citral or geraniol in the organism (HILDEBRANDT), A., ii, 181, 669.
- $C_{10}H_{15}O_5N$, from the action of nitric anhydride on camphene (DEMJANOFF), A., i, 554.
- $C_{10}H_{17}O_5N_3$, and $C_{11}H_{19}O_5N_3$, from antipeptone (SIEGFRIED), A., i, 58.
- $C_{10}H_{18}O_3N_2$, two, from the action of alkali hypobromite on α - and β -camphornitrilamides (TIEMANN and TIGGES), A., i, 20.
- $C_{11}H_{10}O_5$, from the oxidation of mesityl-glyoxylic acid (VAN SCHERPENZEEL), A., i, 328.
- $C_{11}H_{17}O_2$, ethyl ester, from the action of potassium hydrogen sulphate on ethyl methylcyclohexanolisobutyrate (v. BRAUN), A., i, 157.
- $C_{11}H_{18}O_4$, from the oxidation of carbofenchone (WALLACH and v. WESTPHALEN), A., i, 332.
- $C_{11}H_{18}O_4$, from the oxidation of cascarillic acid (FENDLER), A., i, 219.
- $C_{12}H_{12}O_6$, from isoirone (HAARMANN & REIMER), A., i, 727.

- Acid**, $C_{12}H_{14}O_5N_2$, $2H_2O$. from α -keto-valerolactone- γ -carboxylic acid, phenylhydrazone, and sodium hydroxide (WOLFF and HEROLD), A., i, 503.
- $C_{12}H_{24}O_{22}$, and $C_{44}H_{88}O$, from the distillation of the wax from the wild fig tree (GRESHOFF and SACK), A., i, 446.
- $C_{13}H_{22}O_4$, from the distillation of castor oil (THOMS and FENDLER), A., i, 252.
- $C_{14}H_{16}O_6$, from tetrionic acid and mesityl oxide (WOLFF and GABLER), A., i, 285.
- $C_{14}H_{18}O_5$, from the action of potassium hydroxide on $C_{16}H_{19}O_4$ (DIECKMANN), A., i, 542.
- $C_{15}H_{26}O_3$, from α -lupulinic acid, potassium hydroxide solution, and sulphuric acid (BARTH), A., i, 41.
- $C_{18}H_{30}O_5$, from lichens (HESSE), A., i, 57.
- $C_{20}H_{20}O_5$, from the oxidation of polymeric phenylisocrotonic acid (FITTIG), A., i, 145.
- $C_{18}H_{24}O_3$, and $C_{18}H_{24}O_5$, from the action of fused potash on dihydroxystearic acid, and the diamide, amic acid, and acetyl anhydride, salts and ethyl ester of the latter acid (LE SUEUR), T., 1314; P., 1900, 91.
- $C_{21}H_{24}O_9N_6$, and $C_{21}H_{36}O_{10}N_6$, from the digestion of fibrin or Witte's peptone with pepsin (SIEGFRIED), A., i, 176.
- $C_{24}H_{48}O_2$, and $C_{27}H_{54}O_2$, from the wax, $C_{37}H_{74}O_2$ (GRESHOFF and SACK), A., i, 445.
- $C_{27}H_{20}O_6$, from the condensation of benzaldehyde with pyruvic acid (ERLENMEYER), A., i, 390.
- $C_{27}H_{54}O_2$, from the oil of sweet orange-peel (STEPHEN), A., i, 160.
- standard, preparation of an exact (HIGGINS), A., ii, 190.
- Acid amides**, hydrolysis of (REID), A., i, 29.
- Acid anhydrides**. See Anhydrides.
- Acid carbonates**, detection of, in waters (POZZI-ESCOT), A., ii, 346.
- Acid chlorides**, action of, on aldehydes in presence of zinc chloride (DESCUDÉ), A., i, 504, 644.
- action of, on tertiary amines (WEDEKIND), A., i, 639.
- action of, on ethers in presence of zinc (DESCUDÉ), A., i, 357; (FREUNDLER), A., i, 445; (WEDEKIND and HAEUSERMANN), A., i, 536.
- action of, on paraformaldehyde (HENRY), A., i, 581.
- Acid chlorides**, organic, method of preparing (MEYER), A., i, 628.
- Acid cyanides**, preparation of phenylimides of (SACHS), A., i, 272.
- Acidimetry** of aldehydes and ketones (ASTRUC and MUCCO), A., i, 66.
- of arsenic acid (ASTRUC and TARBOURIECH), A., ii, 552.
- of phenol, determination of the, by the thermochemical method (PLOTNIKOFF), A., ii, 229.
- of phosphoric acid (BERTHELOT), A., ii, 502, 504, 551; (CAVALIER), A., ii, 502.
- of *p*-sulphanilic acid (MASSOL), A., i, 532.
- Acids**, soluble in dilute alcohol, from gum tragacanth (O'SULLIVAN), T., 1176; P., 1901, 156.
- from lichens (HESSE), A., i, 85, 149, 595; (ZOPF), A., i, 88, 546; (SALKOWSKI), A., i, 152.
- soluble in ether, in molasses residues (HERZFELD), A., ii, 681.
- formation of, in plants (BERTHELOT), A., ii, 677.
- distribution of, in flowers, leaves, and stems (ASTRUC), A., ii, 677.
- synthesis of, by means of organomagnesium compounds (GRIGNARD), A., i, 679.
- constitutional formulæ of (VORLÄNDER), A., i, 444.
- method of determining the relative affinities of (FENTON and JONES), T., 92; P., 1900, 205; 1901, 24.
- equilibrium between alcohol, esters, water, and (EULER), A., ii, 307.
- action of, on salts of the amines (COLSON), A., ii, 496.
- separation and identification of (ABEGG and HERZ), A., ii, 190.
- Acids, aromatic**, tertiary, synthesis of (BISTRZYCKI and WEHRBEIN), A., i, 712.
- unsaturated, synthesis and products of dehydration of (BAKUNIN), A., i, 710.
- derivatives of (LEUPOLD), A., i, 711.
- Acids of complex function**, titration of (BERTHELOT), A., ii, 497.
- Acids, fatty**, solidification point of (MORESCHINI), A., ii, 48.
- dry distillation of salts of (DILTHEY), A., i, 498.
- benzoylation of, in presence of ammonia (ORTON), T., 1351; P., 1901, 200.
- estimation of, in soaps (BAUD), A., ii, 358.
- saturated, action of zinc powder on (HÉBERT), A., i, 251.

- Acids, fatty**, higher unsaturated, oxidation of, with sulphuric acid and ammonium persulphate (ALBITZKY), A., i, 5.
- Acids, inorganic**, neutralisation of (MIOLATI and MASCETTI), A., ii, 381.
- Acids, non-carboxylic organic**, energy of (COFFETTI), A., i, 29.
- Acids, volatile**, estimation of, in wines (KLEIBER), A., ii, 629.
- Acids**. See also Aldehydo-acids, Amino-acids, Hydroxy-acids, and Ketonic acids.
- Acids (or their salts or derivatives)**. See also :—
- Acetic acid.
- Acetic acid, thio- and thiocyno-.
- Acetoacetic acid.
- Acetoaceticglycine.
- Acetonedicarboxylic acid.
- Acetonylpropylenedibistetric acid.
- o*-Acetoxybenzoic acid (*aspirin*).
- Acetylacetoneglycine.
- 5-*p*-Acetylaminonilino-7-methylnaphthaphenazonium-3-sulphonic acid.
- m*-Acetylaminobenzenesulphonic acid.
- 2-Acetylaminobenzoic acid.
- 4-Acetylamino-1:3-dimethylbenzimidazolone-5-carboxylic acid.
- Acetyl-*o*-aminophenylpropionic acid.
- α -Acetylaminopropionic acid.
- m*-Acetylbenzoic acid.
- α -Acetyl- $\beta\beta$ -dimethyladipic acid.
- Acetylenedicarboxylic acid.
- β -Acetylglutaric acid.
- Acetylimino α thiocarbonic acid.
- Acetylmalono-anilic and -thionanilic acids.
- Acetylphenylglycine-*o*-carboxylic acids.
- α -Acetylpropionic acid.
- 4-Acetylpyrogalloldisulphonic acid.
- Acetyl α thiocarbonic acids.
- β -Acetyltrimethylglutaric acid.
- Acetyltropic acid.
- Acetic acid.
- Acrylic acids.
- Adipic acid.
- Æscorcinolsulphonic acid.
- Æsculetincarboxylic acids.
- Alanine.
- iso*Alantolic acid.
- p*-Aldehydocinnamic acid.
- Alectoric acid.
- Alkylcarbonic acids.
- Alkyleanoacetic acids.
- Alkylsulphonacetic acids.
- Allophanic acid.
- iso*Amylanthranilic acid.
- β -Amylbutyric acid.
- Acids**. See :—
- Amylisocrotonic acid.
- β -Amyl- α -mono- and -di-ethylbutyric acids, *dithio*-.
- β -Amyl- α -mono- and -di-methylbutyric acids, *dithio*-.
- Amyl-3-nitrophthalic acids.
- β -Amyloxypropionic acid.
- Amylpropionic acid (*α -octinoic acid*).
- β -Amylsulphone- α -ethylisocrotonic acid.
- γ -Amylvaleric acid.
- Angelie acid (*pentenoic acid*).
- Anhydrodimehyltetramethylenetricarboxylic acid.
- Anhydro-*p*-nitrobenzenazoacetonedicarboxylic acid.
- Anhydrotetric acid.
- Anilodiacetic-*o*-carboxylic acid.
- Anilic acids.
- Anilineaminosulphonic acid.
- Anilinesulphonic acids.
- Anilinthiosulphonic acids.
- β -Anilinoacrylic acid.
- Anilindiacetic acid.
- β -Anilino-glutaconic acid.
- Anilino-oxalyl-dimethylacetoacetic acid.
- Anilino-*p*-toluidophosphoric acid.
- Aniltrimethylsuccinic acids.
- Anishydroxamic acid.
- Anisic acid.
- Anthrachrysone-2:6-disulphonic acid.
- Anthranilic acid.
- l*-Arabonic acid.
- Asparagine.
- Asparaginic acid.
- Aspartic acid.
- Avivitellie acid.
- Barbituric acid.
- Bassoric acid.
- Benzaldehyde-*o*-sulphonic acid.
- Benzenazoacetonedicarboxylic acid.
- Benzenazo-*o*-nitrosalicylic acid.
- Benzenazosalicylic acid.
- Benzenepentacarboxylic acid.
- Benzenesulphonic acids.
- 7-Benzenesulphonoxy-coumarone-4-carboxylic acid.
- Benzenethiol-sulphonic acid.
- Benzene-1:3:5-tricarboxylic acid.
- Benzhydroxamic acid.
- Benzilic acid.
- Benzoic acid.
- Benzo- β -ketopentamethyleneazincarboxylic acid.
- Benzophenonephosphinic acid.
- Benzophenone-*c*-sulphonic acid.
- Benzo- γ -pyronecarboxylic acid.
- Benzoylacetic acid.
- o*-Benzoylaminobenzoic acid.
- p*-Benzoylaminophenylacetic acid.

Acids. See:—

α -Benzoylamino- β -isopropylacrylic acid.
 Benzoylbenzene-*o*-sulphonic acid.
 Benzoylbenzoic acids.
 Benzoylcarbamide-*o*-sulphonic acid.
 Benzoylcanoacetic acids.
 Benzoylformic acid.
 β -Benzoylglutaric acid.
 Benzoyliminodithiocarbonic acid.
 Benzoylindeneoxalic acid.
 γ -Benzoyl- β -phenylbutyric acid.
 2-Benzoyl-3-phenylcyclopentanone-4-carboxylic acid.
 Benzoyldithiocarbamic acids.
 Benzoylthiolcarbanilic acid.
 β -Benzylbutyric acid.
 α -Benzyleinnamic acid.
 β -Benzylisocrotonic acid.
 Benzylethylaminobenzenesulphonic acid.
 Benzylethylaminobenzoylbenzoic acid.
 Benzylethylaminobenzylbenzoic acid.
 β -Benzyl- α -mono- and -di-ethylbutyric acids.
 Benzyl- β -glutaric acid.
 Benzylideneacetooacetic- β -amino-crotonic acid.
 Benzylidene- β -acetylglutaric acid.
 Benzylideneaniline-4-methyl-2-cyclopentanonecarboxylic acid.
 Benzylidenobarbituric acid.
 Benzylidenebisacetoacetic acid.
 β -Benzylmalamic acids.
m-Benzylmethylaminobenzenesulphonic acids.
 Benzylmethylaminophenylglyoxylic acid.
 β -Benzyl- α -mono- and -di-methylbutyric acids.
 Benzylpiperidinium-bromo-, -chloro-, -iodo-, and -hydroxy-acetic acids.
 Benzylsulphonic acid.
 γ -Benzylvaleric acid.
 Bisazoxyacetic acid.
 Bis-*p*-dimethyl-*o*-carboxycinnamic acid.
 Bis-*p*-dimethylphthalic acid.
 Biscyclopentadienecarboxylic acid.
p-Borobenzoic acid.
 Brassic acid.
 Brassylic acid.
 Brazilic acid.
 Brazilinic acid.
 Bryopogonic acid.
*iso*Bryopogonic acid.
 Butane- $\alpha\gamma$ -dicarboxy- β -acetic acid.
 Butanedicarboxylic acids.
 Butanetetracarboxylic acid.
*iso*Butylanthranilic acid.
 Butyleinnamic acids.
 Butyric acid.

Acids. See:—

*iso*Butyric acid.
 Butyrolactonecarboxylic acid.
 Butyrylacetic acid.
 Butyrylacetooacetic acid.
 Butyrylisobutyric acid.
 β -Butyrylglutaric acids.
 β -Butyryloxyerotic acid.
 Cacodylic acid.
 Caffetaunic acid.
 Callitrolic acid.
 Camphanamic acid.
 Camphanic acid.
 Camphoformeneaminocarboxylic acid.
 Campholytic acids.
*iso*Campholytonic acid (*isolauroic acid*).
 Camphonic acid.
 Camphononic acid.
 Camphopyric acid.
 Camphorenic acid.
 Camphoric acid.
*apo*Camphoric acid.
 Camphornitrilic acids.
*iso*Camphoronic acid.
 Camphoroxalic acid.
 Camphorsulphonic acids.
 Caproic acid (*hexoic acid*).
 Carbamic acid.
 Carbaminodiacetic acid.
 Carbaminoglycylglycine.
 1-Carbamino-5-pyrazolone-3-*p*-nitrobenzeneazoacetic acid.
 Carbazine acids.
 Carbethoxyglycylglycine.
 Carbolic acid.
 Carbonyl-*p*-tolylcarbazine acid.
 Carboxyanthrnilic acid.
 3-*p*-Carboxybenzoylepicolinic acid.
o-Carboxycinnamic acid.
 2-Carboxy-5-methoxyphenoxyacetic acid.
 Carboxymethylthiocarbamic acid.
 Carboxyphenylbutyrolactoneacetic acid.
 Carboxyphenylhydrazonocycanoacetic acid.
 Carpinic acid.
 Carvacroxyfumaric acid.
 Cascarillic acid.
 Cereic acid.
 Cetipic acid.
 Chrysazinsulphonic acid.
 Chrysoidine-2-carboxylic acid.
 Cincholenponic acid.
 Cinchomeronic acid.
 Cinchonic acid.
 Cineolic acids.
 Cinnamic acid.
*allo*Cinnamic acid.
 Cinnamylecacodylic acid.

Acids. See :—

Cinnamylidenobarbituric acid.
 Cinogenic acid.
 Citraconic acid.
 Citric acid.
 Cobalticyanic acid.
 Coccellinic acid.
 Coumalic acid.
*iso*Coumalic acid.
 Coumalin-6-carboxylic acid.
p-Coumaric acid.
 Coumarilic acid.
 Coumarin-4-carboxylic acid.
 Croconic acid.
 Crotonic acid.
 Cuspidatic acid.
 Cyanic acid.
 Cyanuric acid.
 Decanedicarboxylic acid.
 Decinoic acid.
 Dehydromucic acid.
 Diaceticanthranilic acid.
 Diacetylacetic acid.
 $\beta\beta$ -Diacetylpropionic acid.
*iso*Dialuric acid.
 β -Diamylsulphonebutyric acid.
 β -Diamylsulphone- α -mono- and -diethylbutyric acids.
 β -Diamylsulphone- α -mono- and -dimethylbutyric acids.
 β -Diamylsulphonevaleric acid.
 Diazoacetic acid.
*iso*Diazoacetic acid.
 Diazoaminobenzene-2-carboxylic acid.
 Diazoaminobenzene-2:2'-dicarboxylic acid.
o-Diazoaminobenzoic acid.
 Diazobenzenesulphonic acid.
 Dibenzenethiolsulphonic acid.
 Dibenzoylthylenedicarboxylic acid.
 Dibenzoylfumaric acid.
 Dibenzoylhomogentisic acid.
 Dibenzoylmalic acid.
 Dibenzoylmalamic acid.
 Dibenzylmethane-phosphinic and -phosphamic acids.
 β -Dibenzylsulphonebutyric acid.
 β -Dibenzylsulphone- α -mono- and -diethylbutyric acids.
 β -Dibenzylsulphone- α -mono- and -dimethylbutyric acids.
 γ -Dibenzylsulphonevaleric acid.
 Dibutyrylacetacetic acid.
 Dicarboxydimethyltrimethylene-bromo- and -ethyl-malonic acids.
 Dicarboxydimethyltrimethylene-malonic acid.
 Dicarboxyglutaconic acid.
 Dicinnamyltartaric acid.
 Dicrotonic acid.
 Dihydroxybenzoylpyruvic acids.

Acids. See :—

aa-Diethylacetonedicarboxylic acid.
 Diethylamino-benzoyl- and -benzyl-tetrachlorobenzoic acids.
 Diethylaminohydroxyanthraquinone-sulphonic acid.
m-Diethylaminohydroxybenzoyl-benzoic acid.
 Diethylamino-*m*-hydroxybenzyl-benzoic acid.
 Diethylamino-*m*-hydroxy-benzyl- and -benzoyl-tetrachlorobenzoic acids.
 Diethylaminophenylglyoxylic acid.
 $\beta\beta$ -Diethylglutaric acid.
 β -Diethylsulphone- α -diethylbutyric acid.
 β -Diethylsulphone- α -dimethylbutyric acid.
 Difurfuryldicarbinylsuccinic acid.
 Difurfurylthanedicarboxylic acid.
 $\alpha\beta$ -Difurfurylidenepropionic acid.
 Difurfurylidenesuccinic acid.
 β -Diheptoic acid.
 Dihydroæsculetinsulphonic acid.
 Dihydroisovalantolic acid.
 Dihydro- α -campholytic acids.
 Dihydrocarveolacetic acid.
 Dihydrocollidenedicarboxylic acid.
 Dihydrofurfuran-2:5-dicarboxylic acids.
 Dihydroinfracampholenic acid.
 Dihydrolauronic acid.
 Dihydroxyanthraquinonesulphonic acid.
 3:4-Dihydroxybenzoic acid.
 Dihydroxy*apocamphoric* acid.
 Dihydroxydihydrocampholytic acid.
 Dihydroxydihydrocyclogeranic acid.
 Dihydroxydihydrolauronic acid.
aa-Dihydroxy- $\beta\beta$ -dimethylglutaric acid.
 8:8'-Dihydroxy-2:2'-dinaphthylamine-6:6'-disulphonic acid.
p-Dihydroxydiphenyl-4:6-*dinitro*-1:3-phenylenediaminedicarboxylic acid.
p-Dihydroxydiphenyl-4:6-*dinitro*-1:3-phenylenediaminedisulphonic acid.
 Dihydroxyfluorescein.
 Dihydroxymethoxybenzoic acid.
 β -2:4-Dihydroxyphenylmaleic acid.
 Dihydroxypivalic acid.
 Dihydroxystearic acid.
 Dihydroxytartaric acid.
 Dihydroxytrisethoxycarminone-carboxylic acid.
 Diketo*apocamphoric* acid.
 Diketodihydropentanthrenedicarboxylic acid.
 Diketohydrindenecarboxylic acid.
 2:6-Diketo-4-*isopropyl*hexamethylene-3-carboxylic acid.

Acids. See :—

- 2:6-Diketo-3:4:4-trimethylhexamethylene-3-carboxylic acid.
 Diketovalerolactone- γ -carboxylic acid.
 Dilichenostearic acid.
 Dimethoxydiphenyldihydrazonecyanoacetic acid.
 6:7-Dimethoxy-3-methylcoumarilic acid.
 Dimethoxysuccinic acid.
 $\alpha\alpha_1$ -Dimethylacetonedicarboxylic acid.
 Dimethylacrylic acid (*pentenoic acid*).
 $\alpha\alpha'$ -Dimethyladipic acids.
 $\beta\beta$ -Dimethyladipic acid.
 $\delta\delta$ -Dimethylallylacetocetic acid.
 Dimethylaminobenzoylbenzoic acid.
 Dimethylamino-benzoyl- and -benzyl-tetrachlorobenzoic acids.
p-Dimethylaminobenzylidenebarbituric acid.
 Dimethylaminohydroxyanthraquinonesulphonic acid.
 Dimethylaminophenylglyoxylic acid.
 Dimethylanilinetiosulphonic acid.
 Dimethylbenzoic acids.
 6:8-Dimethyl-1:4-benzopyrone-2-carboxylic acid.
 2:4-Dimethylbenzoylbenzene-*o*-sulphonic acid.
 Dimethyltetrabromohydrindacenedicarboxylic acid.
 Dimethylbutane- $\alpha\gamma\gamma$ -tricarboxylic acid.
 $\beta\beta$ -Dimethylbutane- $\alpha\alpha\delta$ -tricarboxylic acid.
 Dimethylcincholeuponic acid.
 2:5-Dimethylcinnamic acid.
 Dimethyldihydrophthalidetetronic acid.
 Dimethylethylethoxyketopentamethylenedicarboxylic acid.
 $\alpha\alpha$ -Dimethyl- β -ethylhydracrylic acid.
 Dimethylglutaconic acid.
 Dimethylglutaric acids.
 $\alpha\epsilon$ -Dimethylheptenoic acid.
 Dimethylcyclohexanecarboxylic acids.
 Dimethylhydroxyphenylmethylenedicarboxylic acid.
 Dimethylindacenedicarboxylic acid.
 Dimethylketopentamethylenecarboxylic acid.
 Dimethylketodicyclopentanecarboxylic acid.
 Dimethylketodicyclopentanedicarboxylic acids.
 5:5-Dimethyl-3-ketodicyclopentane-1:2:4-tricarboxylic acid.
 Dimethylketotetramethylenecarboxylic acids.
 Dimethylketotetramethylenetricarboxylic acid.

Acids. See :—

- $\beta\delta$ -Dimethylævulic acid.
 α s-Dimethylmalic acid.
 Dimethylmethylenecyanoacetic acids.
 $\beta\zeta$ -Dimethyl- $\beta\epsilon$ -nonadiene- θ -one- η -carboxylic acid.
 $\beta\zeta$ -Dimethyl- $\beta\epsilon$ -octadiene- θ -mono- and - $\eta\theta$ -di-carboxylic acids.
 2:5-Dimethylcyclopentane-1-mono- and -1:1-di-carboxylic acids.
 2:2-Dimethylcyclopentane-5-one-1:1-dicarboxylic acid.
 Dimethylphloroglucinolcarboxylic acid.
 Dimethylpropane- $\alpha\gamma\gamma$ -tricarboxylic acid.
 2:5-Dimethylpyrrole-1-acetic acid.
 Dimethylpyruvic acid.
 α s-Dimethylsuccinic acid.
 Dimethyl-*m*-toluidineazobenzene-sulphonic acid.
 Dimethyltrimethylenedicarboxylic acid.
 Dinaphthalenethiolsulphonic acids.
 Dioxycycyanogendicarboxylic acid.
 3:4-Dioxymethylenehydratropic acid.
 Diphenoxylisopropylphosphorous acid.
 Diphenylamine-6-mono- and -6:6'-dicarboxylic acids.
 Diphenylamine-3'-sulphonic acid.
 Diphenylboric acid.
 2:5-Diphenylcarbazine-1-carboxylic acid.
 Diphenylcarboxylic acid.
 Diphenyl-4:4'-dicarboxylic acids.
 Diphenyldihydrazonecyanoacetic acid.
 Diphenyleneoxidesulphonic acid.
s-Diphenylethane-4:4'-dicarboxylic acid.
 Diphenylglycollic acid.
 Diphenylmethane-3:3'-dicarboxylic acid.
 3:6-Diphenylpyridazine-4:5-dicarboxylic acid.
 2:4-Diphenylsemicarbazide-1-carboxylic acid.
 2:4-Diphenylsemicarbazide-1-dithiocarboxylic acid.
 2:4-Diphenylsemithiocarbazide-1-carboxylic acid.
 Diphenylsulphone-4-carboxylic acid.
 β -Diphenylsulphone- α -ethylbutyric acid.
 β -Diphenylsulphone- α -methylbutyric acid.
 γ -Diphenylsulphonevaleric acid.
 2:4-Diphenylthiocarbazide-1-carboxylic acid.
 1:4-Diphenyl-5-thio-1:2:4-triazolone-3-sulphonic acid.
 Diphenyl-*p*-tolylacetic acid.
 $\beta\delta$ -Diphenylvalerolacetoneacetic acid.

Acids. See:—

Dipero-phthalic acid.
 Dipropylsulphamic acid.
 Dipyromucyltartaric acid.
 Ditoluenethiolsulphonic acids.
 Di-*o*-tolylidihydrazonocynoacetic acid.
 Di-*p*-tolylxyisopropylphosphorous acid.
 Ecgonic acid.
 Erythric acid.
l-Erythronic acid.
 Ethanedicarboxylic acid.
 β -Ethoxyacrylic acid.
 Ethoxycaronic acid.
 7-Ethoxychromone-2-carboxylic acid.
 Ethoxymethyleneacetoacetic acid.
 Ethoxymethylenecynoacetic acid.
 1-Ethoxynaphthalene-4-sulphonic acid.
p-Ethoxyphenylhydrazonocynoacetic acid.
p-Ethoxyphenylsuccinamic acid.
 Ethylacetonedicarboxylic acid.
 α -Ethyladipic acid.
m-Ethylaminoazobenzenesulphonic acid.
m-Ethylaminobenzenesulphonic acid.
o-Ethylaminobenzoic acid.
p-Ethylaminophenylglyoxylic acid.
p-Ethylamino-*m*-tolylglyoxylic acid.
 Ethylanthranilic acid.
 β -Ethylsec. butylsulphamic acid.
 β -Ethyl- α -diethylbutyric acid, *dithio*-.
 β -Ethyl- α -dimethylbutyric acid, *dithio*-.
 Ethylene-*p*-*d*iaminodiphenylglyoxylic acid.
 Ethylenetetracarboxylic acid.
 α -Ethylglutaric acid.
 Ethylidenedi-*o*-aminodibenzoic acid.
 Ethylidenebisacetoacetic acid.
 Ethylidenebistetronic acid.
i-Ethylidenelactic acid.
 Ethylmalonic acid.
 Ethylpentanetricarboxylic acid.
 α -Ethylpinelic acid.
 $\beta\beta$ -Ethylpropylglutaric acid.
 β -Ethylsuccinic acid.
 Ethylthioncarbanilic acid.
 α -Ethyltricarballic acid.
 Eugenoxyacetic acid.
 Eugenoxyfumaric acid.
 Euxanthic acid.
 Evermoric acid.
 Fencholenic acids.
 Ferrieyanic acid.
 Ferrisalicylic acid.
 Ferrocyanic acid.
 Ficoceroic acid.
 Filicitanic acid.
 Fluorescein.
 Formalinsulphuric acid.
 Formic acid.

Acids. See:—

*ortho*Formic acid.
 Formylacetic acid.
o-Formylaminobenzoic acid.
 Formyl-*o*-aminophenylpropionic acid.
 Formylglutaconic acid.
 Formylpropionic acid.
 Formyl-*o*-tolylglycine.
 Fulminic acid.
 Fumaric acid.
 Furfuran-2:4-dicarboxylic acid.
 α -Furfurylcarbinyl- β -furfurylidene-propionic acid.
 Furfurylidenebarbituric acid.
 Furfurylidenesuccinic acid.
 Gallein.
 Gallic acid.
 Gallin.
*cyclo*Geranic acids.
d-Gluconic acid.
 Glutaconic acid.
 Glutamic acid.
 Glutaric acid.
 Glyceric acid.
 Glyceroarsenic acid.
 Glycine.
 Glycollic acid.
 Glycuronic acid.
 Glycylglycine.
 Glyoxylic acid.
 Guaiacolsulphonic acid.
 γ -Guanidinebutyric acid.
 Guanidineglyoxylic acid.
 Guanylic acid.
 Gyrophoric acid.
 Hematic acids.
m-Hemipinic acid.
 Heptanedicarboxylic acids.
 Heptanetricarboxylic acids.
*cyclo*Heptenecarboxylic acids.
 Heptenoic acid.
 Hepthydroxamic acid.
 Heptoic acids.
 Heptolactoneacetic acid.
 Hexadecenoic acid.
 Hexahydroxylic acids.
 Hexanedicarboxylic acids.
 Hexanetetracarboxylic acids.
 Hexanetricarboxylic acids.
 δ -*cyclo*Hexenecarboxylic acid.
 β -Hexene- ϵ -one- $\gamma\delta$ -dicarboxylic acid.
 Hexenoic acids.
 Hexoic acid.
*iso*Hexoic acid.
 Hexoylacetic acid.
*iso*Hexoyl*iso*butyric acid.
 Hexylpropionic acid (*noninoic acid*).
 Hippuric acid.
 Homopilopic acid.
 Humic acids.
 Hydantoic acid.
 Hydrazicacetic acid.

Acids. See:—

*iso*Hydrochelidonic acid.
 Hydrocyanic acid.
 β -Hydroxyacrylic acid.
 Hydroxybenzoic acids.
 o -Hydroxybenzoylformic acid.
 β -Hydroxybenzylglutaric acid.
 p -Hydroxybenzylidenobarbituric acid.
 p -Hydroxybenzylidenetolnindinesulphonic acids.
 α -Hydroxy- β -butenoic acid.
 β -Hydroxybutyric acid.
 α -Hydroxycamphorcarboxylic acid.
 β -Hydroxycamphoronic acid.
 6-Hydroxy-5-carboxylamino-2-picoline-3-carboxylic acid.
 p -Hydroxycarboxyphenylhydrazonocyanacetic acid.
 7-Hydroxycoumarone-3-carboxylic acid.
 7-Hydroxycoumarone-4-carboxylic acid.
 Hydroxydihydrocampholytic acid.
 Hydroxydiketohydrindenecarboxylic acid.
 β -Hydroxy- $\alpha\alpha$ -dimethylvaleric acid.
 Hydroxydiphenylacetic acid.
 4'-Hydroxydiphenylamine-6-carboxylic acid.
 2-Hydroxy-4-ethoxybenzoylpyruvic acid.
 Hydroxyethylaminoformic acid.
 Hydroxyethylglutaric acid.
 Hydroxyfenchenic acids.
 Hydroxyhexahydroxylic acids.
 p -Hydroxyhydratropic acid.
 2-Hydroxy-3- o -hydroxyphenylquinoxalinesulphonic acid.
 δ -Hydroxy- α -hydroxyisopropylhexoic acid.
 Hydroxyketodihydrocyclogeranic acid.
 κ -Hydroxy- ι -ketoundecoic acid.
 Hydroxylaminoisobutyric acid.
 Hydroxymercuibenzoic acid.
 β -Hydroxy- α -methylbutyric acid.
 Hydroxymethylenecamphorphosphinic acid.
 Hydroxymethylenecyanoacetic acid.
 Hydroxymethyleneglutaconic acid.
 δ -Hydroxy- α -methylhexoic acid.
 5-Hydroxy-12-methylisonaphthaphenazonium-3-sulphonic acid.
 δ -Hydroxy- α -naphthylamine-4-sulphonic acid.
 1-Hydroxynicotinic acid.
 Hydroxyphenylcinnamic acid.
 6-Hydroxy-3-phenyl- ψ -phenanthroline-2-carboxylic acid.
 6-Hydroxy-2-phenylpyrimidine-4-carboxylic acid.
 p -Hydroxyphenyl- m -tolylaminesulphonic acid.

Acids. See:—

Hydroxyisophthalic acid.
 6-Hydroxy-2-picoline-3-carboxylic acid.
 6-Hydroxy-2-picoline-3:5-dicarboxylic acid.
 Hydroxypilocarpinic acid.
 Hydroxypivalic acid.
 α -Hydroxypropionic acid.
 α -Hydroxyisopropylhexoic acid.
 Hydroxyquinolcarboxylic acid.
 4-Hydroxyquinoline-2-carboxylic acid.
 4-Hydroxyquinoline-3-carboxylic acid.
 7-Hydroxy-2-quinolone-4-acetic acid.
 Hydroxyquinolphthalein.
 Hydroxyroccelic acid.
 m -Hydroxysulphobenzoic acid.
 Hydroxytetrahydrofurfuran-2:5-dicarboxylic acid.
 Hydroxytoluic acid.
 2-Hydroxy- m -tolnic acid.
 p -Hydroxytolylidiphenylacetic acids.
 Hydroxytriazolesulphonic acids.
 p -Hydroxytriphenylacetic acid.
 Hydroxytrimethoxycarminonecarboxylic acid.
 ω -Hydroxyundecylic acid.
 δ -Hydroxy- γ -valerolactone- α -carboxylic acid.
 5-Hydroxy-1:3-xylene-4-sulphonic acid.
 Ichthulic acid.
 Imbricacic acid.
 Indeneoxalic acid.
 Indoxylic acid.
 Infracampholenic acid.
 Jalapic acid.
 Kauric acid.
 Kaurinolic acids.
 Kaurolic acids.
 Ketobutylidenebistetriconic acid.
 ζ -Keto- $\beta\epsilon$ -dimethyloctoic acid.
 Ketoheptyltetriconic acid.
 α -Keto- γ -hydroxybutane- $\alpha\gamma$ -dicarboxylic acid.
 Ketohydroxy-ethoxy- and -isobutoxydihydropentanthrenedicarboxylic acids.
 α -Ketovalerolactone- α -carboxylic acid.
 Kynurenic acid.
 Lactic acids.
*iso*Lauronic acid (*isocampholytonic acid*).
 Lauronic acid.
*iso*Lauronic acid.
 Leucine.
 d -Leucinebenzenesulphonic acid.
 Leuconic acid.
 Lichenostearic acids.

Acids. See:—

Lichestronic acid.
 Lobaric acid.
 Lotusinic acid.
 Lupulinic acid.
 β -Malamic acids.
 Maleic acid.
 Malephenylamic acid.
 Malic acids.
 Malonic acid.
 Melaninic acid.
 Mellitic acid.
 Mercuribenzoic acid.
 o -Mercuridibenzoic acid.
 Mercuriguaiacolsulphonic acid.
 Mercuriphenoldisulphonic acid.
 Mesaconic acid.
 Mesitylenic acid.
 Mesotartaric acid.
 p -Methoxyacrylic acid.
 p -Methoxyatrolactic acid.
 Methoxycarminonecarboxylic acid.
 Methoxycarminonedicarboxylic acid.
 Methoxycaronic acid.
 7-Methoxycoumarone-4-carboxylic acid.
 Methoxymethylenecyanoacetic acid.
 m -Methoxyphenoxycetic acid.
 Methoxyphenylglyoxylic acid.
 Methoxyphenylhydrazonocycanoacetic acids.
 p -Methoxytriphenylacetic acid.
 Methylacetonedicarboxylic acid.
 Methylacetylaminobenzoic acid.
 α -Methylacrylic acid.
 Methyladipic acids.
 m -Methylaminobenzenesulphonic acid.
 Methylaminobenzoic acid.
 4-Methylaminophenyl- μ -cyanoazomethinecarboxylic acid.
 p -Methylaminophenylglyoxylic acid.
 Methylanthranilic acid.
 Methylbenzo- β -ketopentamethyleneazinecarboxylic acid.
 p -Methylbenzoylbenzene- o -sulphonic acid.
 p -Methyl- o -benzylbenzoic acid.
 p -Methylbenzylideneacetoacetic acid.
 p -Methylbenzylidenebisacetoacetic acid.
 β -Methyl- γ -bromoethylglutaric acid.
 Methylbutane- $\alpha\beta\gamma\gamma$ -tetracarboxylic acids.
 Methylbutane- $\sigma\beta\gamma$ -tricarboxylic acids.
 β -Methylbutane- $\alpha\gamma\gamma$ -tricarboxylic acid.
 β -Methyl- β -butenoic acid.
 β -Methyl- α -isobutyladipic acid.
 $\beta\beta$ -Methylbutylglutaric acid.
 Methylbutylhydraerylic acids.
 α -Methylbutyric acid (*vuleric acid*).

Acids. See:—

Methylbutyrylacetic acid.
 2-Methylcamphenepyrrole-3-carboxylic acids.
 Methylcamphoroxalic acid.
 Methylcarbanilic acid.
 α -Methylcinnamic acid.
 Methylcrotonic acids (*pentenoic acids*).
 Methylidimethylolacetic acid.
 Methylene- o -aminobenzoic acid.
 Methylene- di - o -aminodibenzoic acid.
 Methylenebistetronic acid.
 α -Methyleneglutaric acid.
 β -Methyl- α -ethylglutaric acid.
 β -Methyl- β -ethylglutaric acid.
 α -Methyl- β -ethylhydraerylic acid.
 β -Methyl- α -ethylideneglutaranilic acid.
 β -Methyl- α -ethylideneglutaric acid.
 Methyleneethylketotetramethylenecarboxylic acids.
 Methyleneethylketotetramethylenetricarboxylic acid.
 α -Methylglutaric acid.
 δ -Methyl- β -heptene- ζ -one- $\gamma\epsilon$ -dicarboxylic acid.
 β -Methylcyclohexanolacetic acid.
 Methylcyclohexanolbutyric acid.
 Methylcyclohexanolpropionic acid.
 1-Methyl-2-cyclohexanonecarboxylic acid.
 β -Methylcyclohexeneacetic acid.
 β -Methyl- $\gamma\delta$ -hexenoic acid (*heptenoic acid*).
 β -Methylhexoic acid (*heptoic acid*).
 β -Methylhexolactone- γ -carboxylic acid.
 Methylketotetramethylenecarboxylic acid.
 Methylketotetramethylenetricarboxylic acid.
 Methylmalonic acid.
 3-Methylisooxazole-5-carboxylic acid.
 Methylpentane- $\alpha\beta\gamma\gamma$ -tetracarboxylic acids.
 Methylcyclopentanolacetic acid.
 Methyl-2-cyclopentanolcarboxylic acids.
 Methyl-2-cyclopentanonecarboxylic acid.
 3-methyl- Δ^1 -cyclopentenecarboxylic acid.
 9-Methylphenanthroline-7-carboxylic acid.
 3-Methyl- ψ -phenanthroline-2-carboxylic acid.
 α -Methylpimelic acid.
 β -Methylpropane- $\alpha\beta\gamma\gamma$ -tetracarboxylic acid.
 o -Methylisopropylbenzenesulphonic acids.

Acids. See :—

Methylpropyl-1:4-benzopyrone-2-carboxylic acids.
ββ-Methylpropylglutaric acid.
 4-Methyl-1-*isopropyl*-2-*cyclopentanone*-carboxylic acid.
 2-Methyl-5-*isopropylphenylacetic acid*.
 Methylpropylpyrazole-4-carboxylic acids.
 Methylpyrazolecarboxylic acids.
 5-Methylpyrazole-4:5-dicarboxylic acid.
 Methylpyrazolinecarboxylic acids.
 5-Methylpyrazoline-4:5-dicarboxylic acid.
 5-Methylpyrimidinecarboxylic acid.
 1-Methylquinolinesulphonic acid.
 6-Methylquinoxaline-2:3-diacetic acid.
 Methylsuberolacetic acid.
 Methylsuccinic acid.
 Methyltetrahydroquinoliniumiodoacetic acid.
 Methylthio- ψ -uric acid.
 3-Methylthiouric acid.
 4-methylumbelliferone-8-diazosulphonic acid.
 Methyluric acid.
 γ -Methylvaleric acid.
 Mucobromic acid.
 Mucochloric acid.
 Mucophenoxybromic acid.
β-Naphthaleneazodiacetylsuccinic acid.
 Naphthalene-1:8-dicarboxylic acid.
 Naphthalenesulphonic acids.
 Naphthalenethiolsulphonic acids.
 Naphthalic acid.
 Naphthapieric acid.
 1:4-Naphthaquinol-3-acetoacetic acid.
β-Naphthaquinoline-1:3-dicarboxylic acid.
 1:4-Naphthaquinol-3-malonic acid.
α-Naphthaquinone-3-acetoacetic acid.
 1:4:7:10-Naphthatetrazine-2:3:8:9-tetracetic acid.
β-Naphtholazodiphenylhydrazonocynoacetic acid.
 Naphthol-7-sulphonic acid.
α-Naphthol-4-sulphonic acid.
β-Naphthoxyacetic acid.
 Naphthylallophanic acids.
α-Naphthylaminesulphonic acids.
 Naphthylcarbazinic acids.
 1-*β*-Naphthyl-5-methylpyrazole-3:4-dicarboxylic acid.
 Nicotinic acid.
*iso*Nicotinic acid.
n-Nonanedicarboxylic acid.
 Noninoic acid.
 Nonylenic acid.
 $\Delta^{2,4}$ -Norcaradiene-7-carboxylic acid.
 Norcarandicarboxylic acid.

Acids. See :—

Nucleic acids.
 Ocellatic acid.
 α -Octinoic acid.
 Octoic acid.
 Olivetoric acid.
 Olivetorinic acid.
 Opianic acid.
 Orbiculatic acid.
 Orygmanic acid.
 Osmuloxalic acid.
 Oxalacetic acid.
 Oxaldiacetic acid.
 Oxalic acid.
 γ -Oxalocrotonic acid.
 Oxalyldiethylacetoacetic acid.
 Oxalyldimethylacetoacetic acid.
 Oxanilic acid.
 5-*iso*Oxazolone-3-*p*-nitrobenzeneazoacetic acid.
 Oxynitriloformic acid.
 Pannaric acid.
 Parannucleic acid.
 Pelargonic acid (*nonoic acid*).
 Pentanedicarboxylic acids.
 Pentanetetracarboxylic acids.
 Pentanetricarboxylic acids.
 2-*cyclo*Pentanolcarboxylic acid.
*cyclo*Pentanonecarboxylic acid.
n-Pentenecarboxylic acid.
*cyclo*Pentene-1-carboxylic acid.
 Pentenoic acids.
 Perphthalic acid.
 Phenacetyl-*isobutyric acid*.
 Phenacylævnic acid.
 γ -Phenacyl- γ -phenylpyrotartaric acid.
 ψ -Phenanthroline-1:3-dicarboxylic acid.
 Phenethylidenepyrotartaric acid.
 Phenethylitaconic acid.
 Phenethylpyrotartaric acid.
 Phenoxyacetic acids.
 Phenoxybenzoic acid.
β-Phenoxycrotonic acid.
 Phenoxydinitrophenylmalonic acid.
 Phenoxy-*p*-tolyl-*oxyisopropylphosphorous acid*.
 Phenylacetic acid.
 ψ -Phenylacetic acid.
β-Phenylacrylic acid.
 Phenylalanines.
δ-Phenyl- β -amino- β -heptene- ζ -one- γ -dicarboxylic acid.
p-Phenylaminophenylglyoxylic acid.
 Phenyl-*p*-anisylcarbazide-1-carboxylic acids.
 7-Phenylbenzotriazin-8-one-5-*p*-benzoic acid.
 2-Phenyl-4-benzylsemicarbazide-1-carboxylic acid.
 Phenylbromohomocampholic acid.

Acids. See :—

β -Phenyl-*n*-butane- $\alpha\gamma\delta$ -tricarboxylic acid.
 β -Phenyl- β -butenoic acid.
 Phenylbutyrolactoneacetic acid.
 Phenylcarbamimodimethylacrylic acid.
 Phenylcarbimino-2-pyrrolidinecarb-
 oxylic acid.
 Phenylisocrotonic acid.
 2-Phenyl-4:5-dibenzylcarbazine-1-
 carboxylic acid.
 2-Phenyl-5-dibenzylcarbazine-1-carb-
 oxylic acid.
 2-Phenyl-5-diethylcarbazine-1-carb-
 oxylic acid.
 Phenyl-dimethylammoniumiodoacetic
 acid.
p-Phenylenedichlorodipropionic acid.
 1:3-Phenylenediamine-4-sulphonic
 acid.
 Phenylenediaminethiosulphonic acid.
p-Phenylenediisobutyric acid.
 Phenylethylene-oxide-carboxylic acid.
 Phenylethylidenebistetric acid.
 β -Phenyl- α -mono- and -di-ethylbutyric
 acids.
 β -Phenyl- α -ethylisocrotonic acid.
 Phenylglutaric acid.
 Phenylglycine-*o*-carboxylic acid.
 Phenylglyoxylic acid.
 Phenylheptadecenoic acid.
 2-Phenylhydrazinocyclopentene-1-carb-
 oxylic acid.
 Phenylhydrazonocyanoacetic acid.
 Phenylhydroxyhomocampholic acid.
 Phenylmethyl-*n*-acetylglutarimide- α -
 carboxylic acid.
 β -Phenyl- α -mono- and -di-methyl-
 butyric acids.
 Phenylmethylcarbamie acid.
 β -Phenyl- α -methylisocrotonic acid.
 Phenylmethyl- α -cyanoglutaric acid.
 β -Phenyl- α -methylglutaric acid.
 Phenylmethylglutarimide- α -carboxylic
 acid.
 β -Phenylmethylhydracrylic acid.
 2-Phenyl-5-methylphenylcarbazine-1-
 carboxylic acid.
 2-Phenyl-4-methylphenylsemicar-
 bazidecarboxylic acid.
 β -Phenyl- α -methyl- $\alpha\alpha\gamma$ -propanetri-
 carboxylic acid.
 1-Phenyl-3-methylpyrazole-4-carb-
 oxylic acid.
 Phenylmethylpyrazoledicarboxylic
 acids.
 1-Phenyl-5-methylpyridazone-3-carb-
 oxylic acid.
 Phenylmethylsemicarbazide-1-carb-
 oxylic acids.
 Phenyl-naphthionic acid.

Acids. See :—

Phenyl- α - and - β -naphthylamine-6-
 carboxylic acids.
 1-Phenyl-4-*p*-nitrobenzeneazo-5-pyr-
 azolone-3-acetic acid.
 Phenyl-nitrosodiazinesulphonic acid.
 Phenyl-*p*-nitro-*o*-tolylsulphonesulph-
 onic acid.
 Phenylloxycrylic acid.
 3-Phenylcyclopentanone-4-carboxylic
 acid.
 3-Phenylcyclopentanonedicarboxylic
 acid.
 9-Phenylphenanthroline 7-carboxylic
 acid.
 3-Phenyl- ψ -phenanthroline-2-carb-
 oxylic acid.
 9-Phenylphenanthrolinesulphonic
 acid.
 3-Phenyl- ψ -phenanthroline-6-sulphon-
 ic acid.
 1-Phenyl-3-phenylquinolineazone-*p*-
 carboxylic acid.
 α -Phenylpropane- $\alpha\beta\gamma$ -tricarballic
 acid.
 Phenylpropionic acid.
 1-Phenylpyrazole-4-carboxylic acid.
 1-Phenyl-5-pyrazolone-3-*p*-nitrobenz-
 eneazacetic acid.
 Phenylpyrid-*o*-oxazinone-*p*-carboxylic
 acid.
 3-Phenylpyridylketone-*p*-carboxylic
 acid.
 β -5-Phenylpyrrolpropionic acid.
 Phenylpyruvic acid.
o-Phenylsulphonebenzoic acid.
 Phenyl-dithiocarbazinic acid.
 Phenylthiocarbiminoacetic acid.
 Phenylthioleartazinic acid.
 Phenylthioncarbazinic acid.
 3-Phenylthiuric acids.
 Phenyl-*p*-tolylcarbazine-1-carboxylic
 acids.
 Phenyl-*p*-tolylsemicarbazide-1-carb-
 oxylic acid.
 1-Phenyl-1:2:3-triazole-4:5-dicarb-
 oxylic acid.
 α -Phenyltricarballic acid.
 Phenyluraminocrotonic acid.
 Phenylvaleric acids.
 Phloroglucinolcarboxylic acid.
 Phthalaldehyde acid.
 Phthalazonecarboxylic acid.
 Phthalic acid.
*iso*Phthalic acid.
 δ -Phthalimino- α -bromovaleric acid.
 γ -Phthaliminobutyric acid.
 β -Phthaliminoethylbromomalonic
 acid.
 γ -Phthaliminopropylbromomalonic
 acid.
 β -Phthaloylglutaric acid.

Acids. See :—

Piceapimaric acid.
 Piceapimarinic acid.
 Piceapimarolic acid.
 Pieric acid.
*iso*Pieric acid.
*iso*Pilocarpinic acid.
 Pilopic acid.
 Pilopinic acid.
 Piluvic acid.
 Pimaric acids.
 Pimarinic acid.
 Pimarolic acid.
n-Pinelic acid.
 Pinocampheleonic acid.
l-Pipicolinic acid.
 2:6-Piperidinedicarboxylic acids.
 Piperidinesulphonic acids.
 2-Piperidino- α -naphthaquinone 3-malonic acid.
 Piperonalhydroxamic acid.
 Piperonylacrylic acid.
 Piscidic acid.
 Plicatic acid.
 Propanedicarboxylic acids.
 Propiobistetronic acid.
 Propionic acid.
 Propionylacetic acid.
 Propionylformic acid.
 Propionylisopropylacetic acid.
 Propylacetonedicarboxylic acid.
 *β -iso*Propyl- α -acetylbutyric acid.
 α -Propyladipic acid.
n-Propylantranilic acid.
 α -Propylbutanetricarboxylic acid.
 *α -iso*Propyl- *β -isobutylhydracrylic* acid.
 Propylenedicarboxylic acids.
 α -Propylglutaric acid.
 *α -iso*Propylglutaric acid.
*iso*Propylidenebistetronic acid.
 Propylmalonic acid.
*iso*Propylpiperidiniumbromoacetic acid.
 α -Propylpropanetricarboxylic acid.
 Protocatechuic acid.
 Psyllostearic acid.
 Purgic acid.
 Pyrazole-3:4:5-tricarboxylic acid.
 Pyrazolinecarboxylic acids.
 Pyrazoline-3:4:5-tricarboxylic acid.
 Pyrazolone-3-carboxylic acid.
 Pyridine-3-carboxylic acid.
 Pyridinedicarboxylic acids.
 Pyridine-2:3:4-tricarboxylic acid.
 β -Pyridiniummalic acids.
 Pyridoxazinone-*p*-benzoic acid.
 Pyrogalloldisulphonic acid.
 Pyrogallolsulphonic acid.
 Pyromellitic acid.
 Pyromucic acid.
*iso*Pyromucic acid.

Acids. See :—

Pyromucylylhydroxamic acid.
 α -Pyrone- α' -carboxylic acid.
 Pyrotartaric acids.
 Pyrrolidine-2-carboxylic acid.
 Pyruvic acid.
 Quinic acid.
 Quinolinic acid.
 Quinoliumiodoacetic acid.
 2-Quinolone-4-acetic acid.
 Quinoxaline-2:3-diacetic acid.
 Racemic acid.
 Resoreylmaleic acid.
 Rhodizonic acid.
 Rosolic acid.
 Rubazonic acid.
 Rubidic acid.
 Salicylhydroxamic acid.
 Salicylic acid.
 Salicylidenebisbarbituric acid.
 Santalenic acid.
 Sarcosine.
 Selenocyanic acid.
 Silveolic acid.
 Silvinolic acids.
 Sorbic acid.
 Squamatic acid.
 Stearic acid.
 Stilbene-*o*-carboxylic acid.
 Styrylitaconic acid.
 Subereneacetic acid.
 Suberyldihydroxamic acid.
 Succinic acid.
*iso*Succinic acid.
p-Sulphanilic acid.
 5-Sulphanilino-7-methylnaphthaphenazonium-3-sulphonic acid.
 4-Sulphanilino-1:2-naphthaquinone-6-sulphonic acid.
o-Sulphobenzoic acid.
o-Sulphomercuribenzoic acid.
 Sulphophenylglycine-1-carboxylic acids.
 Sulphosalicylic acid.
 Tannic acid.
 Tartaric acid.
 Terpenylic acid.
 Tetradecylacetylenecarboxylic acid (*tetradecylpropionic acid*).
 Tetradecylacetylenesulphonic acid.
 Tetraethyldiacetydic acid.
 Δ^1 -Tetrahydrobenzoic acid.
 Tetrahydroisophthalic acid.
 Tetrahydroquinoliniumiodoacetic acid.
 Tetrahydroquinolylacetic acid.
 Tetrahydrothiophentetracarboxylic acid.
 Tetrahydrouric acid.
 Tetrahydroxyanthraquinone-3:6-disulphonic acid.
 Tetrahydroxylic acids.

Acids. See:—

Tetraketohydrindacenedicarboxylic acid.
 Tetramethylenetetracarboxylic acid.
 Tetrazoditolylsulphonic acid.
 Tetrazolesulphonic acid.
 Tetronic acid.
 Thamnolinic acid.
 Thiocyanic acid.
 Thujoleacetic acid.
*iso*Thujoleacetic acid.
 Thujonoxylglycronic acid.
 Thymoquinonemalonie acid.
 β -Thymoxycinnamic acid.
 Thymoxyfumaric acid.
 Tiglic acid (*pentenoic acid*).
p-Tolueneazodiacetylsuccinic acid.
 Toluenediazoaminobenzoic acids.
 Tolnene-*p*-sulphinic acid.
 Toluene-*p*-sulphonic acid.
 Toluene- ω -sulphonic acid.
p-Toluenethiolsulphonic acid.
 Toluic acids.
 Toluidinoacetic acids.
p-Toluidinoanilinophosphoric acid.
m-Toluidinoazobenzoic acid.
o-Toluidinodiacetic acid.
 Toluidinopropionic acids.
 Toluo- γ -pyronecarboxylic acids.
 Toluoylbenzoic acid.
p-Toluoylisobutyric acid.
 3-*p*-Toluoylpicolinic acid.
p-Tolylallopphanic acid.
p-Tolylcarbazine acid.
 4-*p*-Tolyl-2:6-dimethyldihydropyridine-3:5-dicarboxylic acid.
 β -*p*-Tolylglutaric acid.
o-Tolylglycine.
m-Tolylglyoxylic acid.
p-Tolylhydrazine- α -thiocarbonylchloride- β -carboxylic acid.
 5-*p*-Tolyl-3-methylcyclohexenone-4:6-dicarboxylic acid.
 1-*p*-Tolyl-5-methylpyrazole-4-mono- and -3:4-di-carboxylic acids.
p-Tolynaphthionic acid.
 Tolyloxyfumaric acids.
 Tragacanthan-xylan-bassoric acids.
 Triazobenzoic acids.
 2-Triazo-3:5-dimethylbenzoic acid.
 Tribenzophosphinic acid.
 Triethylammoniumiodoacetic acid.
 $\alpha\beta\gamma$ -Trihydroxybutyric acid.
 Trimesic acid.
 2:4:6-Trimethoxybenzoylpyruvic acid.
 $\alpha\beta\beta$ -Trimethyladipic acid.
 Trimethylbenzoic acids.
 Trimethylbenzoylbenzene-*o*-sulphonic acids.
 Trimethylchlorobutanetricarboxylic acid.

Acids. See:—

Trimethylcincholeuponic acid.
 Trimethylenecarboxylic acid.
 Trimethylenetricarboxylic acid.
 $\alpha\beta\beta$ -Trimethylglutaric acid.
 Trimethylketodicyclopentane-mono- and -di-carboxylic acids.
 Trimethylketodicyclopentanetricarboxylic acid.
 $\beta\beta\gamma$ -Trimethylpentane- $\alpha\gamma$ -olidoic acid.
 Trimethylsuccinic acid.
 Triphenylacetic acid.
 Triphenyltrimesic acid.
 Trindecenoic acid.
 ψ -Tropinecarbonic acid.
 Tyrosine.
 Umbelliferonecarboxylic acids.
 Umbilicic acid.
 Umbilicarinic acid.
 Uncinatic acid.
 Undecanedicarboxylic acid.
 Undecenoic acid.
 Undecylenic acid.
 Undecylic acid.
 Urano-oxalic acid.
 Uric acid.
 Usnic acids.
 Usnic acid.
 Valerhydroxamic acid.
 Valeric acids.
 Valerolactoneacetic acid.
 Valerolactonecarboxylic acids.
*iso*Valerylanthranilic acid.
 Veratric acid.
 Vinylglycollic acid.
 Xylanbassoric acid.
m-Xylenediazoaminobenzoic acid.
 Xylenesulphonic acids.
 Xylenesulphonic acids.
m-5-Xylenol-4-sulphonic acid.
 β -*m*-Xylenoxycinnamic acid.
m-Xylenoxyfumaric acid.
 Xylic acid.
 1:2:4-Xylidine-6-sulphonic acid.
l-Xylonic acid.
 Xylilboric acids.
p-Xylenedichlorodimalonic acid.
m-Xylenediacetoacetic acid.
p-Xylenedimethyldimalonic acid.
 β -2:5-Xylilpropionic acid.
Acolic acid and its salts (HESSE), A., i, 86.
Aconitine, physiological action of (CASH and DUNSEAN), A., ii, 613.
 estimation of, in preparations of aconite (ECALLE), A., ii, 707.
Acoridine (EDINGER and ARNOLD), A., i, 753.
Acridine colouring matters, preparation of (BADISCHE ANILIN- and SODA-FABRIK), A., i, 753.
Acridone, 1:3-dinitro- (COHN), A., i, 642.

Acridone, thio- (KALLE & Co.), A., i, 752.
5-thio- (EDINGER and ARNOLD), A., i, 753.

Acrylethylanilide (BISCHOFF), A., i, 527.

Acrylic acid, polymerisation of (v. PECHMANN and RÖHM), A., i, 253.

Acrylic acid, methyl ester, preparation of (RÖHM), A., i, 251.

action of diazomethane on (v. PECHMANN and BURKARD), A., i, 167.

Acrylic acid, β -amino- α -cyano-, esters (DE BOLLEMONT), A., i, 131.

Acrylic acids, substituted, action of fuming nitric acid on (WAHL), A., i, 663.

Actinæ, intracellular digestion and enzymes in (MESNIL), A., ii, 562.

Actinium compounds, radio-activity induced by (CURIE and DEBIERNE), A., ii, 217.

Actinolite from Bosnia (KIŠPATIĆ), A., ii, 321.

Acylarylamines, alkylation of (LANDER), T., 690; P., 1901, 59.

Acyl groups, wandering of (CLAISEN and HAASE), A., i, 118; (WISLICENUS and KÖRBER), A., i, 187.

Acylhalogenalkylamines, constitution of (STIEGLITZ and SLOSSON), A., i, 462.

Address to His Majesty the King and his reply; P., 1901, 20, 53.

congratulatory, to Glasgow University, P., 1901, 161.

to Professor Markownikoff and his reply, P., 1901, 1, 83.

presidential (THORPE), T., 871; P., 1901, 70.

Adipic acid (*butanedicarboxylic acid*), preparation of (MELLOR), T., 130; P., 1900, 215.

new synthesis of (HAMONET), A., i, 217.

dianilide of (BOUVEAULT and TETRY), A., i, 364.

Adipic acid, β -bromo- (WILLSTÄTTER and HOLLANDER), A., i, 561.

Adrenalin (ALDRICH), A., ii, 564.

Äerobacter, a new genus (BEYERINCK), A., ii, 119.

Æscoriceinsulphonic acid, sodium salts and dibromo-derivative (LIEBERMANN and WIEDERMANN), A., i, 736.

Æsculetin-3- and -4-carboxylic acids and their ethyl esters (v. PECHMANN and v. KRAFFT), A., i, 286.

AFFINITY, CHEMICAL:—

Affinity, measurement of the work done by (COHEN and VISSER), A., ii, 376.

change of position of free, in dissociated groups (LAPWORTH), T., 1266; P., 1901, 93.

AFFINITY, CHEMICAL:—

Affinity of acids, method of determination of the relative (FENTON and JONES), T., 92; P., 1900, 205; 1901, 24.

Affinity coefficient of methyl α -cyano- β -hydroxyacrylate (DE BOLLEMONT), A., i, 117.

Mass action, applicability of the law of, to strong electrolytes (v. STEINWEHR), A., ii, 539.

Reactive power, relation between constitution and (WEGSCHEIDER), A., ii, 229.

Reversible action, $2CO \rightleftharpoons CO_2 + C$ (BOUDOUARD), A., ii, 314, 646, 651.

Chemical reactions in dissolved or gaseous systems (PONSOT), A., ii, 542.

Reactions, molecular and ionic, difference between (ROHLAND), A., ii, 152.

Catalytic actions (RUFF), A., ii, 500.
chemical, theory of (EULER), A., ii, 57, 376; (ZENGELIS), A., ii, 151.

reciprocal influence of two, in the same medium (COTTADORO), A., ii, 544.

of iron salts (MANCHOT and WILHELMS), A., ii, 658.

of colloidal platinum on gas cells (HÖBER), A., ii, 151.

of platinum as affected by poisons (BREDIG and IKEDA), A., ii, 441; (RAUDNITZ), A., ii, 496; (BREDIG), A., ii, 596.

Catalysis (EULER), A., ii, 495.

in concentrated solutions (CRAFTS), A., ii, 444.

in non-homogeneous systems (DRUCKER), A., ii, 230, 376.

of electrolytic gas by colloidal platinum (ERNST), A., ii, 495.

of hydrogen peroxide by gold (BREDIG and REINDERS), A., ii, 442.

in the reaction between hydrogen peroxide and hydriodic acid (BRODE), A., ii, 443.

Chemical equilibrium (BOUDOUARD), A., ii, 383, 646.

and reaction velocity (BANCROFT), A., ii, 88.

influence of pressure in phenomena of (BOUDOUARD), A., ii, 151.

between the different stages of oxidation of the same metal (ABEL), A., ii, 376.

at gas electrodes (BOSE), A., ii, 635.

in the system $Bi_2O_3-N_2O_5-H_2O$ (VAN BEMMELEN and RUTTEN), A., ii, 24.

AFFINITY, CHEMICAL:—

Chemical equilibrium between ester, water, acid, and alcohol (EULER), A., ii, 307.

chemical processes in the system: ether, water and hydrogen chloride (JÜTTNER), A., ii, 595.

between ethyl alcohol and hydrochloric acid (PRICE), T., 305; P., 1900, 185.

Hydrolysis of acid amides (REID), A., i, 29.

of alkyl esters of fatty acids and hydrochloric acid (EULER), A., ii, 307.

of ethyl nitrate by water (V. BIRON), A., i, 111.

of glyceryl esters (HANRIOT), A., ii, 175, 324.

of salts (KULLGREN), A., ii, 149.

of salts in solution, study of, by means of electrical conductivity (SALVADORI), A., ii, 4.

of solanin (SCHULZ), A., i, 92.

Hydrolytic dissociation, new method for the determination of (FARMER), T., 863; P., 1901, 129.

Partition of ammonia between chloroform and aqueous solutions of alkali salts (DAWSON and McCRAE), T., 493; P., 1901, 5.

of ammonia between chloroform and aqueous solutions of salts of the alkaline earths (DAWSON and McCRAE), T., 1069; P., 1901, 177.

of ammonia between chloroform and water, and aqueous copper sulphate and chloroform at varying temperatures (DAWSON and McCRAE), T., 1072; P., 1901, 178.

Velocity and equilibrium of chemical change, lecture experiments illustrating the laws of (NOYES and BLANCHARD), A., ii, 91.

Velocity of combination of ketones with hydroxylamine and with phenylhydrazine (PETRENKO-KRITSCHENKO and LÖDKIPANIDZE), A., i, 505; (PETRENKO-KRITSCHENKO and ELTSCHANINOFF), A., i, 506.

Velocity of conversion of hyoscyamine into atropine by means of alcoholic sodium alkyl oxides (MAZZUCHELLI), A., i, 161.

Velocity of esterification of stereoisomerides (MARKWALD and MCKENZIE), A., ii, 229.

Velocity of gaseous evolutions, measurement of (JON), A., ii, 83.

Velocity of hydration of metaphosphoric acid (MONTMARTIN and ELDI), A., ii, 551.

AFFINITY, CHEMICAL:—

Velocity of hydrolysis, dependence of, on temperature (MADSEN), A., ii, 228.

of ethyl acetate, influence of non-electrolytes on the (KULLGREN), A., ii, 496.

of methyl acetate (COPPADORO), A., ii, 544; (HENRI and BANCELS), A., ii, 647.

of stereoisomerides (MARKWALD and MCKENZIE), A., i, 229.

Velocity of intramolecular migration of bromoamides under the influence of an alkali (VAN DAM and ABERSON), A., ii, 88.

Velocity of inversion of cane sugar (V. LIPPMANN), A., ii, 89; (DUANE), A., ii, 440; (EULER), A., ii, 441.

in presence of methyl acetate (COPPADORO), A., ii, 544; (HENRI and BANCELS), A., ii, 647.

influence of the nature and intensity of light on the (GILLOT), A., i, 127.

action of invert sugar on the (HENRI), A., i, 438.

Velocity of oxidation of solutions of stannous chloride (YOUNG), A., ii, 390.

Velocity of reaction (DUANE), A., ii, 440.

and equilibrium (BANCROFT), A., ii, 88.

and solubility (BANCROFT), A., ii, 150. general equations for, in homogeneous systems (WEGSCHEIDER), A., ii, 57.

before complete equilibrium and before the point of transition (WILDERMANN), A., ii, 544.

between chloroform and potassium hydroxide (SAUNDERS), A., ii, 13.

between ethyl alcohol and hydrochloric acid (PRICE), T., 303; P., 1900, 185.

between ferric salts, chromic acid or nitrous acid and metallic iodides (SCHÜKAREFF), A., ii, 647.

of the β -aromatic hydroxylamines, action of methyl on the (BAMBERGER and RISING), A., i, 529.

Velocity of solution of solid substances (BRUNER and TOLLOCKO), A., ii, 10.

of arsenious oxide (DRUCKER), A., ii, 230, 376.

of chromic chloride (DRUCKER), A., ii, 230.

of iron in hydrochloric acid (CONROY), A., ii, 388.

AFFINITY, CHEMICAL:—

Velocity of solution of zinc in acids (ERICSON-AURÉN), A., ii, 451.

Agglutination of yeast (BARENDRECHT), A., ii, 677.

AGRICULTURAL CHEMISTRY:—

ANIMALS, DAIRY PRODUCTS, FEEDING EXPERIMENTS:—

Bullocks, feeding experiments on (ALBERT), A., ii, 337.

Cattle, maintenance ration of (ARMSBY), A., ii, 271.

sugar as food for (LEHMANN), A., ii, 415.

Cows, feeding experiments on (RAMM), A., ii, 71; (ATWATER and PHELPS; GERLACH), A., ii, 337.

feeding experiments on, with palm kernel cake, crushed palm kernels, and linseed, ricinus and earth nut meals (RAMM, MOMSEN, and SCHUMACHER), A., ii, 469.

See also Butter, Milk, and Feeding Experiments.

Dogs, action of anæsthetics on (WRIGHT), A., ii, 180, 408.

Horses, metabolism in (ZUNTZ), A., ii, 177.

Lambs, feeding experiments on (ALBERT), A., ii, 337.

Pigs, feeding experiments on (GERLACH; ALBERT), A., ii, 337.

feeding experiments on, with sugar, starch, and molasses (MEISSEL and BERSCH), A., ii, 668.

molasses, peat molasses, palm-kernel molasses, palm cake, and sugar as food for (KLEIN), A., ii, 416.

Sheep, gorse as food for (GIRARD), A., ii, 187; (VOELCKER), A., ii, 271.

DAIRY PRODUCTS:—

Butter, influence of feeding on the composition of (WEIGMANN and HENZOLD), A., ii, 187.

causes of the varying composition of (VAN RYN), A., ii, 482.

Dutch, composition of (KIRCHNER and RACINE), A., ii, 137; (REICHER), A., ii, 292; (CLARK), A., ii, 430; (RACINE), A., ii, 536.

influence of the season and feeding on the Reichert-Meissl number of (SWAVING), A., ii, 587.

digestibility of, compared with its substitutes (WIBBENS and HUIZENGA), A., ii, 253.

cryoscopic distinction between margarine and (PESCHGES), A., ii, 630.

See also Feeding Experiments. methods of analysis. See Main Index.

AGRICULTURAL CHEMISTRY: DAIRY PRODUCTS:—

Cheese, production of, by enzymes (EPSTEIN), A., ii, 119; (CHODAT and HOFMAN-BANG), A., ii, 264.

changes in the fat during the ripening of (WINDISCH), A., ii, 188.

methods of analysis. See Main Index.

Cream, methods of analysis. See Main Index.

Milk, influence of the amount of water on the yield of (KOCI), A., ii, 407. composition of, in different stages of milking (HARDY), A., ii, 672. factors determining the richness of (SMITH), A., ii, 338.

the "skin" of warmed (JAMISON and HERTZ), A., ii, 672.

distribution of galactase in different (BARCOCK, RUSSELL, and VIVIAN), A., ii, 406.

biology of the peptonising bacteria of (KALISCHER), A., ii, 119.

production of the fat of (VAN ENGELEN and WAUTERS), A., ii, 36.

refractive power, amount of volatile fatty acids, and the iodine number of the fat of (HOLM, KRARUP, and PETERSEN), A., ii, 291.

lecithin in (BUROW), A., ii, 30.

effect of gestation on the amount of mineral matter, especially phosphoric acid and calcium, in (KÖRT), A., ii, 27.

agreement between the solids of, actually determined and those found by calculation (AMBÜHL), A., ii, 137.

curdling of, by rennet (DE VRIES and BOEKHOUT), A., ii, 258.

calcium and sodium citrates in the coagulation of (SABBATANI), A., ii, 175.

acidity of (VIETH and SIEGFELD), A., ii, 46.

from cows grazing on the Plateau of Sétif (MALMÉJAC), A., ii, 572.

of Indian cows and buffaloes, composition of (LEATHER), A., ii, 291.

sow's, composition of (WOLL), A., ii, 338.

effect of intravenous injection of, on the coagulability of the blood (CAMUS), A., ii, 116.

preservation of, for analysis (DUBOIS), A., ii, 429.

detection of boiled and unboiled (UTZ), A., ii, 428; (GLAGE), A., ii, 429.

See also Cows and Feeding Experiments.

AGRICULTURAL CHEMISTRY: DAIRY PRODUCTS:—

Milk, methods of analysis. See Main Index.

FEEDING EXPERIMENTS:—

Asparagine as a food stuff (ROSENFELD), A., ii, 177.

Beans as food in Servia (ZEGA and KNEZ-MILOJKOVIĆ), A., ii, 468.
and their mill products, composition and feeding value of (KÖHLER), A., ii, 528.

Carob as food for horses (DUGAST), A., ii, 683.

Earthnut meal as food for cows (RAMM, MOMSEN, and SCHUMACHER), A., ii, 469.

Fish meal as food in Germany (LEHMANN), A., ii, 469.

Gorse, feeding value of (GIRARD), A., ii, 187; (VOELCKER), A., ii, 271.

Grapes, pressed, compared with hay and straw, as food for cattle (GUERRIERI), A., ii, 683.

Hemp cake (LEMCKE), A., ii, 272.

Linseed meal as food for cows (RAMM, MOMSEN, and SCHUMACHER), A., ii, 469.

Maize-germ molasses, feeding value of (GERLACH; ALBERT), A., ii, 337.

Malt germs and dried residues of germinated barley, composition and nutritive value of (SCARAFIA), A., ii, 683.

Molasses, feeding experiments with (KELLNER, ZAHN, and v. GILLERN), A., ii, 469.

as food for cows (GERLACH), A., ii, 337.

nitrogenous compounds in (BEGER), A., ii, 272.

Molasses, Peat molasses, and Palm-kernel molasses as food for pigs (KLEIN), A., ii, 416.

Molasses and Molasses-foods, feeding value of (VELICH), A., ii, 529.

Molasses-foods, value of (GONNERMANN), A., ii, 71.

Orange residues as food in Calabria (GABRIELLI), A., ii, 71.

Palm cake as food for pigs (KLEIN), A., ii, 416.

Palm kernels, crushed and as cake, as food for cows (RAMM, MOMSEN, and SCHUMACHER), A., ii, 469.

Peas, and their mill products, composition and feeding value of (KÖHLER), A., ii, 528.

Peat meal, feeding experiments with (KELLNER, ZAHN, and v. GILLERN), A., ii, 469.

AGRICULTURAL CHEMISTRY: FEEDING EXPERIMENTS:—

Ricinus meal as food for cows (RAMM, MOMSEN, and SCHUMACHER), A., ii, 469.

Seaweed as food (SOLLEID), A., ii, 529.

Sugar as food for cattle (LEHMANN), A., ii, 415.

as food for pigs (KLEIN), A., ii, 416.

Vetches, and their mill products, composition and feeding value of (KÖHLER), A., ii, 528.

PLANTS.

PLANT COMPOSITION AND METABOLISM:—

Plants, effect of osmotic pressure on the form and structure of (BEAUVÉRIE), A., ii, 183.

influence of distance on the growth and composition of (v. SEELHORST and PANAJOTOVIC), A., ii, 330.

photosynthesis and the coloration of (GRIFFON), A., ii, 331.

gaseous exchanges between the atmosphere and (SCHLÖSING), A., ii, 31.

absorption of atmospheric methane by (URBAIN), A., ii, 273.

annual migration of nitrogenous and ternary substances in (ANDRÉ), A., ii, 413.

mechanism of esterification in (CHARABOT and HÉBERT), A., ii, 619.

distribution of acidity in flowers, leaves and stems of (ASTRUC), A., ii, 677.

estimation of the acidity in (BERTHELOT), A., ii, 677.

formation of asparagine in (SCHULZE), A., ii, 184, 332, 467.

presence and amount of copper in (HECKEL), A., ii, 331.

hydrocyanic acid in (SOAVE), A., ii, 332.

occurrence of organic iron compounds in (SUZUKI), A., ii, 678.

formation of proteids in (ZALESKI), A., ii, 619.

conditions of the production of proteids in (MAYER), A., ii, 526.

production of proteids in, in absence of light (IWANOFF; SCHULZE), A., ii, 184.

influence of carbohydrates on the production of proteids in (SCHULZE), A., ii, 333.

reproduction of proteids in, from the products of their decomposition (SCHULZE), A., ii, 184.

AGRICULTURAL CHEMISTRY: PLANTS:—

- Plants**, genesis of terpenoid compounds in (CHARABOT), A., ii, 34.
 rôle of the chlorophyllic function in the genesis of terpenic constituents in (CHARABOT), A., ii, 183.
 zinc in (FRICKE), A., ii, 34; (LABAND), A., ii, 467.
 action of hydrogen cyanide on (JOHNSON), A., ii, 334.
 action of ether on (FISCHER), A., ii, 335.
 etiolated, development of, after exposure to light (RICOME), A., ii, 120.
- PLANTS:—**
Ash, loss of sulphur in preparing (FRAPS), A., ii, 421.
Buds, chemical changes during the evolution of (ANDRÉ), A., ii, 120.
Cell walls, fixation of metals by (DEVAUX), A., ii, 571.
Chlorophyll (NENCKI and MARCHLEWSKI), A., i, 554.
 use of photobacteria to show the functioning of (BEYERINCK), A., ii, 523.
 yellow colouring matters accompanying, and their spectroscopic relations (SCHUNCK), A., i, 734.
Chlorophyllous assimilation without living organisms (FRIEDEL), A., ii, 411.
 influence of pressure on (FRIEDEL), A., ii, 267.
Leaves, green, aldehyde in (REINKE and BRAUNMÜLLER), A., ii, 332.
 nitrogenous constituents of (WINTERSTEIN), A., ii, 619.
 winter, carbohydrate metabolism in (CZAPEK), A., ii, 571.
Pollen of sugar beet, chemical composition of (STIFT), A., ii, 412.
Root nodules, effect of inoculating material on the production of (NOBBE and HILTNER), A., ii, 187.
Roots, investigation on (MÜLLER-THURGAU), A., ii, 525.
Sap of the vanilla plant from the Congo (HÉBERT), A., ii, 34.
Seedlings, exosmosis of diastase by (LAURENT), A., ii, 69.
Seeds, quiescent, respiration of (KOLKWITZ), A., ii, 570.
 production of alcohol during the intramolecular respiration of, in water (GODLEWSKI and POLZENIUSZ), A., ii, 618.
 microchemical examination of aleurone-grains of (TSCHIRCH and KRITZLER), A., ii, 33.

AGRICULTURAL CHEMISTRY: PLANTS:—

- Seeds**, diffusion of enzymes in (LUMIA), A., ii, 33.
 germinated, proteolytic ferment in (BUTKEWITSCH), A., ii, 182, 466.
 non-germinating, presence of seminase in (BOURQUELOT and HÉRISSEY), A., ii, 69.
 behaviour of the pentosans of, during germination (SCHÖNE and TOLLENS), A., ii, 267.
 proteids of (BOKORNY), A., ii, 415.
Respiration of quiescent seeds (KOLKWITZ), A., ii, 570.
 influence of anaesthetics on (MORKOWIN), A., ii, 331.
- Plant growth**, toxic action of various metallic salts on (DEHÉRAIN and DEMOUSSY), A., ii, 266; (COUPIN), A., ii, 335.
 toxic action of ammonium, potassium and sodium compounds on (COUPIN), A., ii, 122.
 action of potassium salts on (COUPIN), A., ii, 525.
 damage done to, by mercury (DAFERT), A., ii, 269; (COUPIN), A., ii, 335.
 toxic value of mercuric chloride and its double salts in (CLARK), A., ii, 526.
- Germination**, *rôle of oxygen in* (MAZÉ), A., ii, 33.
 evolution of phosphorus and sulphur during the commencement of (ANDRÉ), A., ii, 525.
 in distilled water (DEHÉRAIN and DEMOUSSY), A., ii, 266.
 of seeds as affected by certain chemical manures (HICKS), A., ii, 330.
 of seeds, chemical changes in the (SHULOFF), A., ii, 330.
 effect of copper sulphate on (DEHÉRAIN and DEMOUSSY), A., ii, 266; (COUPIN), A., ii, 335; (DEMOUSSY), A., ii, 570.
 action of formaldehyde on (WINDISCH), A., ii, 466.
 influence of temperature on the energy of the decomposition of proteid in (PRIANISCHNIKOFF), A., ii, 120.
- PLANTS:—**
Apples, chemical changes in, during ripening (OTTO), A., ii, 678.
Barley, cultivation of (PAGNOUL), A., ii, 123.
 pot experiments on (VOELCKER), A., ii, 270.
 manuring experiments with organic nitrogen compounds on (THOMSON), A., ii, 620.

AGRICULTURAL CHEMISTRY: PLANTS:—

- Barley**, influence of potassium salts on the development of (STOKLASA and PITRA), A., ii, 621.
 influence of manure and the amount of water in the soil on the growth and composition of (v. SEELHORST and GEORGS), A., ii, 274.
 brewing, production of, with low percentage of nitrogen on light soils (RÉMY), A., ii, 186.
 Norwegian, analyses of (WERENSKIÖLD), A., ii, 336.
- Beetroot** (sugar), nutrition of (STOKLASA), A., ii, 528.
 in alkali soil (MYERS), A., ii, 468.
 manuring experiments on, with potassium salts (SCHULZE), A., ii, 621.
 methods of analysis. See Main Index.
- Buckwheat**, gaseous exchanges between the atmosphere and (SCHLESING), A., ii, 31.
 chlorine requirements of (MAYER), A., ii, 416.
- Carob** (*Ceratonia Siligua*), composition of (DUGAST), A., ii, 683.
- Carrots**, *Bacillus carotovorus* the cause of the rotting of (JONES), A., ii, 264.
- Clover**, influence of the amount of water in the soil, and the manure, on the yield and composition of (v. SEELHORST, GEORGS, and FAHRENHOLTZ), A., ii, 682.
- Cocoonut**, composition of the, during germination (KIRKWOOD and GIES), A., ii, 267.
- Colchicum**, physiological significance of colchicine in different (ALBO), A., ii, 679.
- Conifer seeds**, composition of some (SCHULZE), A., ii, 467.
- Crops**, action of sodium bromide and iodide, and lithium chloride on (VOELCKER), A., ii, 269.
- Gorse**, cultivation of (GIRARD), A., ii, 187; (GUÉPIN), A., ii, 271.
 utilisation of (GIRARD), A., ii, 187.
 as food for sheep (GIRARD), A., ii, 187; (VOELCKER), A., ii, 271.
- Grasses**, composition of, from different meadows (EMMERLING, WEBER, BACHÉK, and HILBERT), A., ii, 186.
- Hay**, examination of, to ascertain the changes in the amounts of food constituents, phosphoric acid, and potash, caused by different manuring (SCHULZE), A., ii, 682.

AGRICULTURAL CHEMISTRY: PLANTS:—

- Hibiscus cseulentus*, composition of the fruit of (ZEGA), A., ii, 70.
- Hops**, autumnal return of substances in (FRUWIRTH), A., ii, 185.
 bitter principles of (BARTH), A., i, 40.
 manurial experiments on (RÉMY), A., ii, 35; (BARTH), A., ii, 72.
- Ivy** as a calcareous plant (v. KLENZE), A., ii, 185.
- Leguminosæ**, cultivation of (MALPEAUX), A., ii, 270.
 effect of inoculating material on the yield of (NOBBE and HILTNER), A., ii, 187.
- Lime trees**, constituents of the bark of (BRAUTIGAM), A., i, 93.
- Lupinus albus*, migration of nitrogenous and ternary substances in (ANDRÉ), A., ii, 413.
 nitrogenous constituents of the seeds and seedlings of (WASSILIEFF), A., ii, 185.
- Maize**, assimilation in (v. SIGMOND), A., ii, 70.
- Mangel-wurzels**, chemical study of (GERBIDON), A., ii, 337.
 experiments with English, French, and German (WOHLTMANN), A., ii, 573.
- Merendera**, physiological significance of colchicine in different (ALBO), A., ii, 679.
- Nasturtiums**, gaseous exchanges between the atmosphere and (SCHLESING), A., ii, 31.
- Oats**, variation in the amount of nutritive substances in (ATTERBERG), A., ii, 573.
 alinit experiments with (SCHULZE), A., ii, 527.
 manuring experiments with organic nitrogen compounds on (THOMSON), A., ii, 620.
- Olives**, cultivation and composition of (BRACCI), A., ii, 35.
- Peas**, nitrogen in (JOHANNSEN), A., ii, 35.
- Pine trees**, injury to, by smoke (SORAUER and RAMANN), A., ii, 36.
- Potato ash**, effect of water and manure on the composition of (v. DASZEWSKI), A., ii, 72.
- Potatoes**, formation of solanine in, by Bacteria (WEIL), A., ii, 266.
 green manure experiments on (CLAUSEN), A., ii, 72.
- Rye grain**, composition of, at different stages of ripeness (NEDOKUCHAEFF), A., ii, 331.

AGRICULTURAL CHEMISTRY: PLANTS:—

- Rye grass**, Italian, influence of the amount of water in the soil, and the manure, on the yield and composition of (V. SEELHORST, GEORGS, and FAHRENHOLTZ), A., ii, 682.
- Serradella**, manurial experiments with calcium carbonate on (SCHULZE), A., ii, 528.
- Sinapis alba*, migration of nitrogenous and ternary substances in (ANDRÉ), A., ii, 413.
- Sunflower plant** (WILEY), A., ii, 336.
- Swedes**, estimation of sugar in (COLLINS), A., ii, 583.
- Tea plant**, amount of theine in different parts of the (SUZUKI), A., ii, 679.
- Tobacco plant**, assimilation in the (V. SIGMOND), A., ii, 70.
- Trapa natans*, composition of (ZEGA and KNEZ-MILOJKOVIĆ), A., ii, 269.
- Vanilla plant** from the Congo, sap of (HÉBERT), A., ii, 34.
- Vegetable life**, physiological function of enzymes in (SOAVE), A., ii, 267.
- Vegetables**, composition and nutritive value of (BALLAND), A., ii, 572.
- quantity of pentosans in (WITTMANN), A., ii, 414.
- Vine culture** (OLIVERI and ROMANO), A., ii, 527.
- Vine leaves**, soluble constituents of (BÖTTINGER), A., ii, 269.
- Voandzeia subterranea*, composition of (BALLAND), A., ii, 415.
- Water chestnut**, composition of (ZEGA and KNEZ-MILOJKOVIĆ), A., ii, 269.
- Wheat**, cultivation of (GIGLIOLI; OLIVERI and ROMANO), A., ii, 527.
- pot experiments on (VOELCKER), A., ii, 270.
- variation in the amounts of gluten in (VIGNON and COUTOURIER), A., ii, 335.
- Wheat grain**, relation between the weight and the percentage of nitrogen in (JOHANNSEN and WEIS), A., ii, 72.

SOILS.

- Soil-sampling**, method of (HAZARD), A., ii, 282.
- Soils**, chemical examination of (BERJU), A., ii, 193.
- humidity of, and denitrification (GIUSTINIANI), A., ii, 569.
- albumin-forming bacteria in (GERLACH and VOGEL), A., ii, 675.
- calcium compounds in (MEYER), A., ii, 273.
- hydrolysis and decomposition of fats and fatty acids in the (RUBNER), A., ii, 273.

AGRICULTURAL CHEMISTRY: SOILS:—

- Soils**, movement of water and solutions of salts in (KRAWKOW), A., ii, 73.
- manurial requirements of typical (GERLACH), A., ii, 417.
- testing of, as regards their manurial requirements (SCHULZE), A., ii, 681.
- arable, absorption of calcium phosphate by (DUMONT), A., ii, 274.
- alkali, of the Yellowstone Valley (WHITNEY and MEANS), A., ii, 73.
- banana, of Jamaica (COUSINS), A., ii, 681.
- calcareous, valuation of materials for improving (IMMENDORFF), A., ii, 130.
- cultivated, soluble salts of (KING and JEFFREY), A., ii, 338.
- mineral, free humic acids in (IMMENDORFF), A., ii, 620.
- from German East Africa, analysis of (STUTZER), A., ii, 283.
- Groningen, effect of manures on (DE VRIES), A., ii, 684.
- from Madagascar, agricultural value of (MÜNTZ and ROUSSEAU), A., ii, 273.
- condition of aluminium in (SCHLESING), A., ii, 471.
- from the sea-bed of the Red Sea (NATTERER), A., ii, 173.
- of the Province Rheinhessen in the Rheingau and Taunus (LUEDECKE), A., ii, 417.
- of the experimental field of the Royal University of Bremen at Rosenthal (v. RÜMKER and HOFFMANN), A., ii, 418.
- wheat, of Broadbalk, Rothamsted, chemical study of the phosphoric acid and potash contents of the (DYER), A., ii, 339.
- methods of analysis. See Main Index.
- Humus**, absorption of calcium phosphate by (DUMONT), A., ii, 274.
- methods of analysis. See Main Index.
- Peat**, constituents of (PETERMANN), A., ii, 36.
- NITRIFICATION, NITROGEN, AND NITROGENOUS COMPOUNDS:—**
- Nitrification** and denitrification (BEDDIES), A., ii, 569.
- rate of, of some fertilisers (WITHERS), A., ii, 523.
- of humus (RIMBACH), A., ii, 37.
- Nitrates**, cause and importance of decomposition of, in soil (KRÜGER and SCHNEIDEWIND), A., ii, 470.

AGRICULTURAL CHEMISTRY: SOILS:—

Nitrates, reduction of, in presence of farmyard manure (STREET), A., ii, 329.

Nitrogen, free atmospheric, assimilation of, by Mycelia (HILTNER), A., ii, 32.

and phosphoric acid, assimilation of, at three periods of growth (BIELER and ASÖ), A., ii, 682.

in horn-meal, value of, as compared with nitric nitrogen (GERLACH), A., ii, 574.

in soil, effect of various carbonaceous compounds on the amount of (GERLACH), A., ii, 574.

Mycelia, assimilation of free atmospheric nitrogen by (HILTNER), A., ii, 32.

Denitrification, processes of (LEMMERMANN), A., ii, 524; (BEDDIES), A., ii, 569.

in soil (AMPOLA and ULIANI), A., ii, 524.

effect of moisture on (GIUSTINIANI), A., ii, 569.

of farmyard manure (PFEIFFER and LEMMERMAN), A., ii, 37.

Denitrifying organisms and their action in the soil (KRENZ and GERLACH), A., ii, 410.

behaviour of, in culture solutions (STUTZER), A., ii, 264.

WATER.

Drainage water and salt swamps of the Odessa irrigation fields (SELIWANOFF), A., ii, 530.

Lysimeter experiments in 1899 (HANAMANN), A., ii, 276.

MANURES AND MANURING EXPERIMENTS:—

Manures, economy in the application of (POMORSKI), A., ii, 123.

artificial, effect of, on humus (DEVRIES), A., ii, 684.

effect of, on the germination of seeds (HICKS), A., ii, 330.

methods of analysis. See Main Index.

Alinit, inoculation of the soil with (MALPEAUX), A., ii, 417.

Ammonium sulphate, manurial experiments with (KRAUS), A., ii, 340.

Bone meal, manurial effect of (DAFERT and REITMAIR; DAFERT; KELLNER and BÖTTCHER), A., ii, 275. methods of analysis. See Main Index.

Calcium carbonate as a manure (SCHULZE), A., ii, 528.

Calcium phosphate, absorption of, by arable soil and humus (DUMONT), A., ii, 274.

AGRICULTURAL CHEMISTRY: MANURES:—

Cow urine and **dung**, losses of nitrogen in fresh, kept in thin layers, alone, and with straw (KRENZ and GERLACH), A., ii, 418.

Farmyard manure, preservation of (WAGNER), A., ii, 530.

action and denitrification of (PFEIFFER and LEMMERMAN), A., ii, 37. fermentation of nitrogenous substances in (DEHÉRAIN and DUPONT), A., ii, 684.

Green manure (ENGELHARDT), A., ii, 276.

Guano from Erythraea (AMPOLA), A., ii, 341.

"**v. Krottnaurer's patent manure**," manurial value of (BÖTTCHER), A., ii, 471.

"**Leipzig pondrette**," manurial value of (BÖTTCHER), A., ii, 471.

Locusts as manure (HÜNCKEL D'HERCULAI), A., ii, 342.

"**Martellin**" as a manure (WOHLTMANN), A., ii, 573.

Nitrogenous manures, experiments with (SCHULZE), A., ii, 620.

Nitrogenous materials as manures (VOORHEES), A., ii, 341.

Phosphate, Algerian, manuring experiments with (DAFERT), A., ii, 620.

Phosphoric acid, effect of different forms of (DAFERT and REITMAIR), A., ii, 275.

in soils (SCHLÖSING), A., ii, 470.

in bone meal, the citric acid solubility of (METHNER), A., ii, 278.

from various sources, box experiments with (MERRILL), A., ii, 341.

Potassium nitrate, effectiveness of, as compared with a combination of potassium chloride and sodium nitrate (WHEELER and TILLINGHAST), A., ii, 340.

Potassium salts, manurial experiments with (SCHULZE), A., ii, 621.

influence of, on the development of barley (STOKLASA and PITRA), A., ii, 621.

Slag, basic. See Main Index.

Sodium nitrate, use of, containing perchlorate (VOELCKER), A., ii, 270.

free iodine in (DAFERT and HALLA), A., ii, 621.

manurial experiments with (KRAUS), A., ii, 340.

Stable manure, use of pepsin solution for investigating (PFEIFFER and LEMMERMAN), A., ii, 189.

albumin-forming bacteria in (GERLACH and VOGEL), A., ii, 675.

AGRICULTURAL CHEMISTRY: MANURES:—
Superphosphate, basic, its preparation and use as a manure (HUGHES), A., ii, 471.
Manuring experiments (SEBELIEN), A., ii, 468.
 in 1899 (HANAMANN), A., ii, 528.
 on cultivated plants (GODLEWSKI), A., ii, 573.
 at Jersitz-Posen in 1898–1899 and 1899–1900 (GERLACH), A., ii, 416.
 with excrement (KRENTZ and GERLACH), A., ii, 621.
Air. See Atmospheric air.
Akee, oil of (GARSED), A., ii, 136.
Alanine, derivatives of (FISCHER), A., i, 192; (FISCHER and FOURNEAU), A., i, 675.
*iso***Alantolactone** and its hydrochlorides and nitro-derivative, and *iso***Alantolic acid** and its salts, ethyl ester, amide and acetyl derivative (SPRINZ), A., i, 325, 387.
Albite from Amelia, Virginia (ERBEN and CEIPEK), A., ii, 169.
 in green schist from Piedmont (PREISWERK), A., ii, 560.
 from the Tatra mountains (GORAZDOWSKI), A., ii, 170.
Albumen of the seeds of *Phoenix canariensis*, composition of, and the chemical changes accompanying their germination (BOURQUELOT and HÉRISSEY), A., ii, 619.
Albumin, decomposition of (DENNSTEDT), A., i, 780.
 oxidation of (SCHULZ), A., i, 780.
 products of the digestion of (FRÄNKEL and LANGSTEIN), A., i, 575.
 formation of acetone from (BLUMENTHAL and NEUBERG), A., i, 433.
 transformation of, into globulin (STARKE), A., i, 242.
 formation of an isatin derivative from (GNEZDA), A., i, 780.
 methyl mercaptan from (NENCKI), A., i, 242.
 peptones from (PAAL), A., i, 623.
 precipitation of, in urine, by clarifying agents (GRÜTZNER), A., ii, 295.
 detection of, in urine (PRAUM; ROCH), A., ii, 710.
Albumin, egg-, hydrolysis of (FISCHER), A., i, 745.
 coagulation of (GUÉRIN), A., ii, 211.
 crystallised, glucosamine from (LANGSTEIN), A., i, 108.
 formation of urea by the oxidation of, with ammonium persulphate (HUGOUNENQ), A., i, 491.
Albumins in dropsical pus (MALMÉJAC), A., ii, 566.

Albumins, albumoses, peptones, and syntonins of muscular tissue, differentiation between (BILTÉRYST), A., ii, 632.
Albuminoids. See Proteids.
Albuminuria, physiological relations of intermittent (CHARRIN), A., ii, 181.
Albumose, an, in urine (MILROY), A., ii, 68.
Albumoses, chemistry of (HAYASHI), A., i, 354.
 albumins, peptones, and syntonins of muscular tissue, differentiation between (BILTÉRYST), A., ii, 632.
Deuteroalbumose and **Heteroalbumose**, hexon bases in (HASLAM), A., i, 492.
Alcapton urine, benzylation of (ORTON and GARROD), A., ii, 614.
Alcohol. See Ethyl alcohol.
Alcohol, $C_6H_{12}O_2$, from the reduction of methylacetylacetone (ZELINSKY and ZELIKOFF), A., i, 657.
 $C_8H_{16}O_2$, and its diacetyl derivative, from the reduction of the aldol, $C_8H_{14}O_2$ (PLATTENSTEINER), A., i, 255.
 $C_{10}H_{14}O_2$, and its diacetyl derivative, from the reduction of the aldol, $C_{10}H_{12}O_2$ (HACKHOFFER), A., i, 278.
 $C_{10}H_{22}O_5$, and its penta-acetyl derivative, from propyldiallylcarbinol (MARKO), A., i, 251.
 $C_{11}H_{18}O_2$, from the action of zinc dust and acetic acid on carbofenchonone (WALLACH and V. WESTPHALEN), A., i, 332.
 $C_{11}H_{22}O$, from ethyl malonate and magnesium ethiodide (VALEUR), A., i, 317.
 $C_{13}H_{26}O$, from the hydrolysis of the wax $C_{27}H_{74}O_2$ (GRESHOFF and SACK), A., i, 445.
 $C_{15}H_{26}O$, from amyrol (v. SODEN and ROJAHN), A., i, 159.
Alcohol bases (HENRY), A., i, 16, 68; (STRAUSS), A., i, 17; (MATTHES), A., i, 259, 513.
Alcohols, synthesis of, by means of organo-magnesium compounds (BÉHAL), A., i, 246; (MASSON), A., i, 249; (GRIGNARD), A., i, 250, 263, 393, 679; (TISSIER and GRIGNARD), A., i, 316, 440; (VALEUR), A., i, 317.
 new method for the synthesis of (GUERBET), A., i, 182, 307.
 action of, on acetals of monohydric alcohols (DELÉPINE), A., i, 365.
 influence of light on the interaction of, with aldehydes and ketones (CIAMICIAN and SILBER), A., i, 329.

Alcohols, action of, on chloral (GABUTTI), A., i, 367.
 action of, on cobalt and iron salts (DITZ), A., ii, 222.
 action of nitric acid on (KONOWALOFF), A., i, 249.
 action of, on the arterial blood stream (BUCHNER, FUCHS, and MEGELE), A., ii, 562.
 etherification of, by inorganic salts (ODDO), A., i, 495.
 chlorocarbonates of (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 662, 663, 697.
 compounds of, with complex acids (V. BAEYER and VILLIGER), A., i, 659.
Alcohols, aromatic, synthesis of, by means of formaldehyde (STOERMER and BEHN), A., i, 726.
Alcohols, fatty, and calcium carbide (LEFEBVRE), A., i, 441.
 compounds of, with aluminium chloride (PERRIER and POUGET), A., i, 442.
Alcohols, primary, synthesis of (MOUREU and DESMOTS), A., i, 442.
 oxidation of, by contact-action (TRILLAT), A., i, 441.
Alcohols, secondary, action of nitric acid on (PONZIO), A., i, 577.
 carbamates of (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 662, 663.
Alcohols, secondary and tertiary, oxidation of, by contact-action (TRILLAT), A., i, 496.
Alcohols, tertiary cyclic, synthesis by means of magnesium alkyl haloids (ZELINSKY), A., i, 660.
Alcohols and Phenols. See also :—
 Acetophenonepinacone.
 5-Acetyl-amino-2-naphthol.
 2-Acetylaminophenol.
 Acetylcarbinol.
 4-Acetylcatechol.
 Acetylmethylcarbinol.
 Acetylmethylenechlorohydrin.
 4-Acetylpyrogallol.
m-Alkylaminophenols.
 Allyl alcohol.
 Allylphenols.
 Amyl alcohols.
 Amyrol.
 Anhydro-*p*-ethoxyaminobenzylalcohol.
 Apiosedextrosephloroglucinol.
 Benzaurin.
 Benzeneazo-*o*-bromo-*p*-cresol.
 Benzeneazo-*p*-cresol.
 Benzeneazo- β -naphthol.
 Benzene-4-azoresorcinol.
 Benzhydrols.

Alcohols and Phenols. See :—
 Benzopinacone.
 1:4-Benzopyranols.
 δ -Benzoyl- $\alpha\beta$ -butanediol.
 Benzoylcresols.
 Benzyl alcohol.
 Benzylcarbinol.
 Benzylcarvacrol.
 Benzyl-*m*-cresol.
 Benzylidimethylcarbinol.
m-Benzylethylaminophenol.
 Benzylideneamylamine- β -naphthol.
 Benzylideneanilinaphthols.
 Benzylidenebenzylamine- β -naphthol.
 Benzylidene- β -naphthol.
 Benzylidene- β -naphthylamine- β -naphthol.
 Benzylidenephnylhydrazinenaphthols.
 Betitol.
 $\alpha\delta$ -Butanediol (*tetramethylene glycol*).
 Butanol.
 Butyl alcohols.
*iso*Butylene-chlorohydrius.
 Butylene glycol.
 Campherol.
 Carvacrol.
 Catechol.
*iso*Chavibetol.
 α -Chlorohydrin.
 Cœrulein.
 Cresols.
 Dehydrothymol.
 Diacetyl-*o*-aminophenol.
 Diisomylcarbinol.
 Dianisyl-disazo- α -naphthol.
 Diisobutylcarbinol.
 Diethylamylcarbinol.
 Diethylisobutylcarbinol.
 Diethyloctylcarbinol.
 β -Diheptyl alcohol.
 Dihydroxyanhydro-2:4-dimethyl-1:4-benzopyranols.
 2:8-Dihydroxy-3:7-dimethylacridine.
 $\alpha\gamma$ -Dihydroxy- $\beta\delta$ -dimethylpropane.
 2:2'-Dihydroxydiphenyl.
 Dihydroxyfluorescein.
 1:5-Dihydroxy-3-methoxyxylene.
 2:3-Dihydroxycyclopentane.
 Dihydroxyphenanthrene.
 Dihydroxy-2-phenylanhydro-4-methyl-1:4-benzopyranols.
 2:6-Dihydroxypyridine.
 2:4-Dihydroxyquinoline.
 4:4'-Dihydroxytetraphenylmethane.
 Dihydroxytriphenylmethane.
 2:5-Dihydroxy-1:3-xylene.
 Dimethylallylcarbinol.
 4-Dimethylamino*cyclo*heptanol.
 Dimethylamylcarbinol.
 Dimethylisomylcarbinol.
 $\beta\zeta$ -Dimethyl- β -decene- θ -ol.

Alcohols and Phenols. See :—

Dimethylethylcarbinol.
 1:3-Dimethylcyclohexanol-3.
 Dimethylhexylcarbinol.
 2:4-Dimethylimino- ψ -quinol.
 $\beta\beta$ -Dimethylol- γ -pentanol.
 $\alpha\alpha$ -Dimethylolpropaldehyde.
 Dimethylcyclopropylcarbinol.
 1:3-Dimethyl-4-*isopropylcyclo-*hexanol-3.
 2:4-Dimethyl- ψ -quinol.
 Dinaphthylene alcohol.
 Dinaphthylene glycol.
 Dioetyl alcohol.
 Diosphenol.
 Diphenol.
 1:2-Diphenyl-1:2-dihydroxycyclopentane.
 $\alpha\epsilon$ -Diphenyl- $\alpha\epsilon$ -dihydroxypentane.
 Diphenyldisazo- α -naphthol.
 1:3-Diphenyl-2-methyltrimethylene glycol.
 Erythritols.
 Estragol.
 Ethanoldiisocamylamine.
 Ethanoldiisobutylamine.
 Ethanoldipropylamine.
 α -*p*-Ethoxyphenyl- $\beta\beta$ -dimethyl- $\alpha\gamma$ -propanediol.
 o -Ethoxyphenylethyl alcohol.
 Ethyl alcohol.
m-Ethylaminophenol.
 Ethylene ethyl alcohol.
 Ethylene glycol.
p-Ethylphenol.
 Ethyl-*p*-quinol.
 Eugenol.
*iso*Eugenol.
 Eupittone-black.
 Ficocerylic alcohol.
 Fluorene alcohol.
 Fluorescein.
 2-Furfurylisoamylcarbinol.
 Gallein.
 Glycerol.
 Glycol, $C_{10}H_{22}O_2$.
 Glycolliminohydrin.
 Glycols.
 Gnaiacol.
 Harmalol.
 Heptyl alcohol.
 Heptylene glycol.
 Hexahydroxydiphenyl.
 cycloHexanepinacone.
 $\alpha\beta\epsilon$ -Hexanetriol.
 cycloHexanol.
 7-Hydroxyanhydro-2:4-dimethyl-1:4-benzopyranol.
 Hydroxyazobenzene.
 o -Hydroxybenzeneazo-*p*-toluene.
 4-Hydroxybenzyl alcohol.
 Hydroxybenzylideneindene.

Alcohols and Phenols. See :—

Hydroxycamphene.
 Hydroxydimethylcoumarin.
 7-Hydroxy-2:4-diphenylbenzodihydropyran.
 7-Hydroxy-2:4-diphenyl-1:4-benzopyranol.
 β -Hydroxydiphenylethane.
 2-Hydroxy-7-ethoxy-3- o -hydroxyphenylquinoxaline.
 2-Hydroxyfluorene.
 Hydroxyhydrindene.
 2-Hydroxy-3- o -hydroxyphenylquinoxaline.
 2-Hydroxy-5-methylbenzaldehyde.
 1-Hydroxy-3-methoxycarbonyl-4-aminoxylene.
 3-Hydroxymethylpyridine.
 7-Hydroxy-2-phenylanhydro-4-methyl-1:4-benzopyranol.
 o -Hydroxyphenylethyl alcohol.
 5- β -Hydroxy- β -phenylethyl-2-ethylpyridine.
 β -Hydroxy- β -phenyl-2-ethylpyridine.
 7-Hydroxy-2-phenyl-4-methylbenzopyran.
 6-Hydroxy-3-phenyl- ψ -phenanthroline.
 6-Hydroxy-2-picoline.
 α -Hydroxy- α -propoxy- $\beta\beta\beta$ -trichloroethanes.
 2-Hydroxy- β -*p*-isopropylphenylethylpyridine.
 Hydroxyquinol.
 Hydroxyquinolines.
 Hydroxyquinolphthalein.
 4-Hydroxy- o -quinone.
 Hydroxytetramethylpiperidines.
 p -Hydroxytriphenylcarbinol.
 Indophenols.
 Indoxyl.
 Leuco-eupittone.
 Licareol.
 Limonenol.
 Maltol.
 Mannitol.
 Menthols.
 o -Mercuridiphenol.
 Mesityl- ψ -quinol.
 1-Methanal-2-naphthylol.
 3-Methoxy-2:6-dimethylphenetriol.
 Methylacetylcarbinol.
 Methyl alcohol.
 Methylaminocresol.
 Methyl- α -aminoethylcarbinol.
m-Methylaminophenol.
 β -Methylanthranol.
 Methylborneol.
 Methylbutylallylcarbinols.
 4-Methylidaphnetin.
 Methyl-diisoamylcarbinol.
 1-Methyl-3-ethylcyclohexanol-3.

Alcohols and Phenols. See:—

Methylfenchyl alcohol.
 Methylgrauatonine pinacone.
 1-Methylcyclohexanol-1.
 Methylhexene- β - and - ϵ -ols.
 Methylhexylcarbinol.
 Methylisopropylallylcarbinol.
 1-Methyl-3-*n*- and -*iso*-propylcyclohexanols-1.
 Methyl- $\alpha\beta$ -cyclotrimethylene-daphnetin.
 Methyl- $\alpha\beta$ -cyclotrimethyleneumbelliferone.
 4-Methylumbelliferone.
 Morphenol.
 Myrcenol.
 α -Naphthaleneazo-*o*-cresol.
 α -Naphthaleneazophenol.
 α -Naphthaleneazo-thymol.
 1:4-Naphthaquinol-2-tetramethyldiaminodiphenylmethane.
 β -Naphthol- β -azophenylbenzimidazoles.
 Naphthols.
 α -Naphthyldimethylcarbinol.
 Naphthylolnaphthyloxynaphthylmethane.
 β -Octinyl alcohol.
 Octyl alcohols.
 Orcinol.
 Papaverinol.
 β -Pentene- δ -ol.
 Phenol.
 Phenols.
 Phenylisobutylcarbinol.
 Phenylisobutylcarbinol.
 Phenyldimethylcarbinol.
 Phenyl-di- β -naphtholmethane.
 Phenylethyl alcohol.
 2-Phenyl-6-*o*-hydroxystilbazole.
 Phenylmethylallylcarbinol.
 Phenylpropargyl alcohol.
 Phenylpropylcarbinols.
 Pierie acid.
 Pinacone $C_{18}H_{30}O_2$.
 Pinoresinol.
 Propanol.
 Propenylphenols.
 Propionylcarbinol.
n-Propyl alcohol.
*iso*Propyl alcohol.
 Propyldiallylcarbinol.
 Propylene glycol.
 Psyllostearyl alcohol.
 Quinitol.
 Quinol.
 Quinols.
 ψ -Quinols.
 Resorcinol.
 Rhododendrol.
 Salol.
 Terpeneols.

Alcohols and Phenols. See:—

Tetramethyldiaminophenyl-anthranol and -oxanthranol.
 Tetramethylenecarbinol.
 Tetramethylene glycol.
 1:2-cycloTetramethyleneumbelliferone.
 Tetraphenylcyclopentenol.
 Tetrazolol.
 Thymol.
 Thymoquinol.
 Tolueneazodibromophenols.
 Tolueneazo- β -naphthols.
 Tolueneazo-*o*-nitrophenols.
 Tolueneazophenols.
p-Toluquinol.
p-Tolylsulphonocarbinol.
 Triacetonealkamine.
 Triheptyl alcohol.
 1:2:4-Trihydroxybenzene.
 Trihydroxyiminotriphenacylamine.
 Trihydroxypentane.
 Trihydroxypentanethrene.
 2:2':2''-Trihydroxy-1:1':1''-trinaphthylmethane.
 Trimethylenecarbinol.
 Trimethyltrimethylene glycols.
 Trioctyl alcohol.
 Triphenylcarbinol.
 Triphenylsilicol.
 Tropanol.
 Usnetol.
 α -Vinylacetonealkamine.
 Violein.
 Xyleneols.
Aldazine, $C_{12}H_{20}N_2$, from the action of hydrazine hydrate on α -methyl- β -ethylacetaldehyde (DEMME), A., i, 256.
Aldehyde, first appearance of, in the mammalian embryo (JACOBY), A., ii, 670.
Aldehyde, $C_7H_{12}O$, from the aldol, $C_7H_{14}O_2$ (WOGGINZ), A., i, 254.
Aldehydes, study of (EIBNER), A., i, 376.
 preparation of (IPATIEFF), A., i, 248.
 $R \cdot CHMe \cdot CHO$, preparation of (BOUGAULT), A., i, 383, 392.
 specific difference between ketones and (OECHSNER DE CONINCK and SERVANT), A., i, 126.
 acidimetry of (ASTRUC and MURCO), A., i, 66.
 condensation of (LIEBEN), A., i, 449.
 influence of light on the interaction of, with alcohols (CIAMICIAN and SILBER), A., i, 329.
 action of acid chlorides on, in presence of zinc chloride (DESCUDE), A., i, 504, 644.
 condensation products of, with amines (HANTZSCH and SCHWAB), A., i, 378.

Aldehydes, action of, on diamines (SCHOLTZ and JAROSS), A., i, 485.
 action of barium hydroxide and of sodium on (LEDERER), A., i, 669.
 condensation of, with barbituric acid (CONRAD and REINBACH), A., i, 410; (WEINSCHENK), A., i, 528.
 action of benzamidine on (KUNCKELL and BAUER), A., i, 759.
 condensation of, with ethyl cyanoacetate (BERTINI), A., i, 537.
 action of hydrazobenzenes on (RASSOW; RASSOW and LUMMERZHEIM), A., i, 777.
 action of, on β -naphthol (ROGOFF), A., i, 152; (HEWITT and TURNER), A., i, 207.
 condensation of, with β -naphthol and amines (BETTI), A., i, 81, 611, 753; (BETTI and SPERONI), A., i, 81, 778.
 compounds of, with aminophenylguanidine (PELLIZZARI and RICKARDS), A., i, 769.
 compounds of, with complex acids (V. BAeyer and VILLIGER), A., i, 659.
 compounds of, with proteids (SCHWARZ), A., i, 297.
 bisulphite derivatives, new mode of decomposition of (FREUNDLER and BUNEL), A., i, 505.
 formation of amides from (PICKARD and CARTER), T., 520; P., 1901, 45.
 detection and identification of (RIMINI), A., i, 450.
 estimation of, volumetrically (RIPPER), A., ii, 205.
Aldehydes of the acetylene series, syntheses of (MOUREU and DELANGE), A., i, 581.
Aldehydes, aliphatic, action of diazobenzene on (BAMBERGER and MÜLLER), A., i, 778.
Aldehydes, aromatic, synthesis of (REFORMATSKY), A., i, 327.
 condensation of, with primary aromatic amines and their sulphonic acids (WALTER), A., i, 694.
 substituted, action of 2-methyl-5-ethylpyridine on (CASTNER), A., i, 562; (BACH), A., i, 609.
 action of, on 2-picoline (ROTH), A., i, 165; (BACKE), A., i, 562.
Aldehydes. See also:—
 Acetaldehyde.
 Acetoxymethylfurfural.
 Acetyl bromal.
 Acetyl chloral.
 Aldols.
 Amyl propionaldehyde.
 Benzaldehyde.
 Benzeneazohydroxytolualdehydes.

Aldehydes. See:—
 Benzeneazoresorcyaldehyde.
 Benzoxymethylfurfural.
 Bromal.
*iso*Butaldehyde.
*iso*Butaldol.
 Chloral.
 Cinnamaldehyde.
 Citral.
*cyclo*Citrals.
 Citronellaldehyde.
o-Cresolaldehyde.
 Crotonaldehyde.
 Cuminaldehyde.
 Difurfuryl ethanediolaldehyde.
 Dihydroxydihydrocitronellaldehyde.
 Dimethylaminobenzaldehyde.
 2:5-Dimethylbenzaldehyde.
 $\beta\zeta$ -Dimethyl- $\beta\epsilon$ -octadiene- θ -al.
 $\alpha\alpha$ -Dimethylolpropaldehyde.
 Diosphenol.
 3:4-Dioxymethylenehydratropaldehyde.
p-Ethoxybenzaldehyde.
 Formaldehyde.
 Furfuraldehyde.
 Glyceraldehyde.
 Glycolaldehyde.
 Glyoxal.
 Hepteno-aldehyde.
 Hydroxyazoaldehydes.
p-Hydroxybenzaldehyde.
 α -Hydroxy*iso*butaldehyde.
 β -Hydroxy- $\alpha\alpha$ -dimethylpropaldehyde.
 2-Hydroxy-5-methylolbenzaldehyde.
 Hydroxynaphthaldehydes.
 Hydroxytolualdehydes.
 Lemonal.
 Metaformaldehyde (*trioxymethylene*).
 1-Methanal-2-naphthylol.
 α -Methyl- β -ethylacetaldehyde.
 Methylfurfural.
 3-Methyloctanone-7-al.
 Methylvanillin.
 Myrcenyl aldehyde.
 Nonaldehyde.
 Paraformaldehyde.
 Propaldehyde.
 Salicylaldehyde.
 Succindialdehyde.
 5-*p*-Sulphobenzeneazo-2-hydroxy-m-tolualdehyde.
o-Triazobenzaldehyde.
p-Triazobenzaldehyde.
 2-Triazo-3:5-dimethylbenzaldehyde.
 Tri-2:5-dimethylbenzaldehyde.
 Trioxymethylene.
*iso*Valeraldehyde.
 Vanillin.
Aldehyde-acids, aliphatic - γ - and aromatic - α - (BISTRZYCKI and HERBST), A., i, 386.

- p*-Aldehydocinnamic acid, methyl ester (EPHRAIM), A., i, 688.
- Aldol** (*acetalalol*) (HALPERN), A., i, 255.
action of phenylhydrazine on (TRENER), A., i, 232.
from isobutaldehyde and salicylaldehyde (HERZOG and KRÜH), A., i, 213.
 $C_6H_{12}O_5$, and its oxime and diacetate, from the condensation of α -hydroxybutaldehyde with acetaldehyde (ROESLER), A., i, 669.
 $C_7H_{14}O_2$, and its oxime, from the condensation of isovaleraldehyde with acetaldehyde (WÖGRINZ), A., i, 254.
 $C_7H_{14}O_2$, and its oxime, from the condensation of isobutaldehyde with propaldehyde (KOHN), A., i, 255.
 $C_8H_{14}O_2$, and its oxime, from the condensation of isobutaldehyde with crotonaldehyde (PLATTENSTEINER), A., i, 254.
 $C_{10}H_{12}O_2$, from the condensation of benzaldehyde with propaldehyde (HACKHOFFER), A., i, 277.
 $C_{13}H_{18}O_3$, from *o*-ethoxybenzaldehyde and isobutaldehyde (HERZOG and KRÜH), A., i, 213.
 $C_{13}H_{18}O_3$, from the condensation of *p*-ethoxybenzaldehyde and isobutaldehyde (HILDESHEIMER), A., i, 645.
- Aldols**, preparation of (LIEBEN), A., i, 449.
- iso***Aldoxime ethers**, intramolecular rearrangement of (WEGENER), A., i, 152.
- Aldoximes**, action of alkyl haloids on (DUNSTAN and GOULDING), T., 628; P., 1901, 84.
aromatic and aliphatic, oxidation of (BAMBERGER and SCHEUTZ), A., i, 548.
- o*-Aldoximophenylazo-*o*-aldoximoanilide (BAMBERGER and DEMUTH), A., i, 392.
- Alectoric acid** and acid from it (HESSE), A., i, 149.
- Aleurone-grains**, microchemical examination of (TSCHIRCH and KRITZLER), A., ii, 33.
- Alexin**, origin of the, of blood serum (GENGOV), A., ii, 256.
- Algæ**, lower chlorophyllous, assimilation and fixation of nitrogen by (KRÜGER and SCHNEIDWIND), A., ii, 411.
- Algodonite** from Lake Superior (KÖENIG), A., ii, 109.
- Alimentary canal**, cellulose digestion in the (MÜLLER), A., ii, 252.
- Alimentary substances**, estimation of "saccharin" in (DÉFOURNEL), A., ii, 588.
- Alinit**. See Agricultural Chemistry.
- Alkali**, free, estimation of, in presence of carbonate (RIDENOUR), A., ii, 691.
- Alkali chlorates and chlorides**, solubility of (WINTLER), A., ii, 96.
chlorides and nitrates, electrical conductivity of aqueous solutions of (KOHLEAUSCH and MALTEY), A., ii, 82.
ferrates, electrochemical formation of (HABER and PICK), A., ii, 103; (PICK), A., ii, 554.
haloids, molecular depression of the temperature of maximum density of aqueous solutions of (DE COPPER), A., ii, 493.
iodates, electrical conductivity of solutions of, and a formula for calculating the conductivity (KOHLEAUSCH), A., ii, 221.
periodates, electrolytic preparation of (MÜLLER), A., ii, 380.
metals, electrolytic preparation of (FISCHER), A., ii, 96.
infra-red spectra of the (LEHMANN), A., ii, 142.
salts, vapour pressure of aqueous alcoholic solutions of (WREWSKY), A., ii, 56.
sulphates and barium, simultaneous presence of, in mineral waters (CARLES), A., ii, 506.
persulphates, properties and estimation of (MOREAU), A., ii, 575.
thiosulphates, action of potassium permanganate on (DOBBIN), A., ii, 311.
- Alkaline earth carbonates**, action of acids on, in presence of alcohol (VALLÉE), A., ii, 239.
estimation of, in soils (IMMENDORFF), A., ii, 130.
metals, infra-red spectra of the (LEHMANN), A., ii, 142.
salts, vapour pressure of aqueous alcoholic solutions of (WREWSKY), A., ii, 56.
- Alkalinity** of solutions containing chlorates, chromates and hypochlorites (v. HUBER), A., ii, 276.
- Alkalis**, reactions of carbon monoxide and oxygen in presence of (BERTHELOT), A., ii, 17.
poisonous effects of solutions of (MOORE), A., ii, 68.
of complex function, titration of (BERTHELOT), A., ii, 497.
- Alkaloids** from angostura bark (HARTWICH and GAMPER), A., ii, 70.
occurrence of, in Cactaceæ (HEFFTER), A., i, 736; (HEVL), A., i, 738.
from *Catha edulis* (BEITLER), A., ii, 268.

Alkaloids of *Chelidonium majus* (SCHMIDT), A., i, 742; (WINTGEN), A., i, 743.

from *Erysimum aureum* (SCHLAGDENHAUFFEN and REEB), A., i, 39.

of *Eschscholzia californica* (SCHMIDT), A., i, 742; (FISCHER), A., i, 743.

of *Glaucium luteum* (SCHMIDT), A., i, 742; (FISCHER), A., i, 743.

of mandragora roots (THOMS and WENTZEL), A., i, 405; (HESSE), A., i, 740.

of the Papaveraceæ (SCHMIDT), A., i, 742.

of *Peganum Harmala* (FISCHER), A., i, 405.

from the balsam of *Picea vulgaris* (TSCHIRCH and BRÜNING), A., i, 92.

from the resin-balsam of *Pinus Pinaster* (TSCHIRCH and BRÜNING), A., i, 221.

of *Sanguinaria canadensis* (SCHMIDT; FISCHER), A., i, 742.

solubility of, in carbon tetrachloride (SCHINDELMEISER), A., i, 287.

behaviour of acid aqueous solutions of, towards different solvents, and resisting power of, to putrefaction (PROELSS), A., ii, 706.

vegetable, action of, on certain indicators (ASTRUC), A., i, 604.

action of *p*-xylylene bromide on (MANOUKIAN), A., i, 528.

aryltiosulphonates of (TRÖGER and LINDE), A., i, 338.

nitro-derivatives of, physiological action of (WALKO), A., ii, 669.

physiological action of some (SCHMIEDEBERG), A., ii, 674.

analytical chemistry of the (KIPPENBERGER), A., ii, 52, 79.

microchemical investigation of (POZZI-ESCOT), A., ii, 432, 485.

formalsulphuric acid as a test for (WIRTHLE), A., ii, 363; (ELIAS), A., ii, 630.

estimation of the amount of, in cinchona barks (VAN KETEL), A., ii, 362.

estimation of, in drugs (GORDIN), A., ii, 485.

estimation of, in urine (GUILLEMARD), A., ii, 521.

Alkaloids. See also :—

Aconitine.

l-isoAmylconiine.

Anhalamine.

Anhalonidine.

Arginine.

Aspidospermine.

Atropine.

3-Benzylxanthine.

Brucine.

Caffeine.

Alkaloids. See :—

Chelerythrine.

Chelidonine.

Cinchonidine.

Cinchonines.

Cinchotoxine.

Cocaine.

*iso*Codeine.

Colchicine.

Conhydrine.

Corybulbine.

Corydaline.

Cotarnine.

Creatine.

Creatinine.

Cytisine.

Damascenine.

Deoxyguanine.

Deoxyxanthine.

2:6-Dimethylxanthine.

Egonine.

Echinopsine.

Epinephrine.

7-Ethylconiine.

3-Ethylxanthine.

Glaucine.

Guanine.

Harmaline.

Harmine.

Homochelidonine.

Hydrocinchonine.

Hydroxycytisine.

Hyosine.

Hyoscyamine.

ψ -Hyoscyamine.

Japaconitine.

Mandragorine.

Methi-*isomorphimethine*.

Methylanhalonidine.

Methylbenzaconine.

Methylenedicytisine.

Methylgranatonine.

Methylmezealine.

Methylmorpholine.

Methylquinine.

Methylxanthines.

Mezealine.

Morphidine.

Morphine.

*iso*Morphine.

Morpholine.

Nicotine.

Nicotelline.

Nicotimine.

Nicotine.

Pectenine.

Phenylmorpholine.

3-Phenylxanthine.

Pilocarpine.

*iso*Pilocarpine.

Pilocerine.

Piperine.

Alkaloids. See:—

Z-Propylconiine.

Protopine.

Pseudoaconitine.

Pyraconitine.

Quinine.

Quinotoxine.

Sambucine.

Sanguinarine.

Scopolamine.

Solanine.

Strychnine.

Tautocinchonine.

Thebenidine.

Theobromine.

Theophylline.

Tropidine.

Xanthine.

Alkyl bromide or iodide, action of, on magnesium (GRIGNARD), A., i, 263, 679; (TISSIER & GRIGNARD), A., i, 440.

carbonates, preparation of (FARBEN-FABRIKEN VORM. F. BAYER & Co.), A., i, 662; (CHEMISCHES FABRIK VON HEYDEN), A., i, 696.

haloids, nitrates, and sulphates, dissociation of (NEF), A., i, 626.

haloids, action of, on aldoximes and ketoximes (DUNSTAN and GOULDING), T., 628; P., 1901, 84.

iodides, combination of, with tertiary amines (WEDEKIND), A., i, 639.

thiocyanates and isothiocyanates, action of, on thioacetic and thio-benzoic acids (WHEELER and MERRIAM), A., i, 514.

m-Alkylaminophenols, preparation of (GRIMAUD), A., i, 269.

Alkylation of acylarylamines (LANDER), T., 690; P., 1901, 59.

Alkylbenzenes, bromination and iodination of (EDINGER and GOLDBERG), A., i, 22, 23.

β -Alkylbutenoic acids (β -alkylvinyl-acetic acids), γ -cyano- (GUARESCHI), A., i, 630.

Alkylcarbamic acids, esters, preparation of (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 662, 663.

Alkylcyanoacetic acids, esters, action of, on diazonium chlorides (FAVREL), A., i, 363.

Alkyl- ψ -indophenazines (MARCHLEWSKI and BURACZEWSKI), A., i, 348.

Alkylmalonic acids, action of, on diazonium chlorides (FAVREL), A., i, 621.

Alkylloxides, sodium, action of, on benzophenone chloride and on benzylidene chloride (MACKENZIE), T., 1206; P., 1901, 150.

p-Alkyloxybenzylanilines, new method of preparing, and their homologues (FRITSCH), A., i, 268.

Alkylquinazolines, formation of (GOTTHELF), A., i, 766.

Alkyls, displacement of, from phenols by nitration (LARTER), P., 1901, 183.

Alkylsulphonacetic acids, anilides of (GROTHE), A., i, 79.

β -Alkylvinylacetic acids. See β -Alkylbutenoic acids.

Allantoin, formation of, from uric acid in the body (SWAIN), A., ii, 610.

imino-, and its salts (DOEBNER and GÄRTNER), A., i, 261.

Allophanic acid, ethyl ester, formation of, from the azoimides of hydroxy-acids (CURTIUS and MÜLLER), A., i, 779.

Alloys made in the electric furnace (HAMILTON and SMITH), A., ii, 385.

thermal and electrical conductivity of (JAEGER and DIESSELHORST; RIETZSCH), A., ii, 84.

specific heat of (MAZZOTTO), A., ii, 492.

the specific volume as the determining criterion of chemical combination in (MAEY), A., ii, 655.

density of (VAN AUBEL), A., ii, 453.

hardness of (BENEDICKS), A., ii, 374.

action of ammonia on, at high temperatures (BEILBY and HENDERSON), T., 1245; P., 1901, 190.

Allyl alcohol, compounds of, with mercuric haloids, constitution of (SAND), A., i, 458.

Allyl disulphide (BLANKSMA), A., i, 461.

sulphide, thermochemistry of (BERTHELOT), A., ii, 146.

Allylbenzamide, 2-chloro- (WHEELER and MERRIAM), A., i, 515.

Allylmalamides, *d*- α - and *l*- β - (LUTZ), A., i, 10.

p-Allyloxyphenyl-carbamide and -thiocarbamide (SIEGEL and SAEBATH), A., i, 534.

Allylphenols, isomeric, colour reactions to distinguish (CHAPMAN), A., ii, 76.

Allylphenylcarbamide, β -chloro- (DIXON), T., 558; P., 1901, 49.

Allylthiocarbimide, β -chloro-, action of ammonia, aniline, benzylamine, benzyl-aniline, phenylhydrazine, piperidine, and *o*- and *p*-toluidine on (DIXON), T., 554; P., 1901, 49.

Allylthiohydantoin, chloro- (DIXON), T., 556; P., 1901, 49.

Aloes from Natal (TSCHIRCH and KLAVERNESS), A., i, 399.

from Uganda (TSCHIRCH and KLAVERNESS), A., i, 602.

- Aloin**, oxidation of, with potassium persulphate and with Caro's acid (SEEL), A., i, 92.
- Alpinia officinarum***, colouring matter from (PERKIN), P., 1901, 87; (TESTONI), A., i, 92.
- Alpinia oil** from *Alpinia malaccensis* (VAN ROMBURGH), A., i, 219; (SCHIMMEL & Co.), A., i, 394.
- Alpinin** (TESTONI), A., i, 92.
- Alum**, detection of, in wines (LOPRESTI), A., ii, 198.
- Alums**, melting points and solubilities of (LOCKE), A., ii, 656.
- Aluminium**, supposed alteration of the properties of (SPICA), A., ii, 602.
- change in the chemical properties of, when in contact with mercury (LEBOX), A., ii, 20.
- heat of rapid combustion of (BERTHELOT), A., ii, 388.
- melting point of (HOLBORN and DAY), A., ii, 85.
- mercury couple, use of, as a halogen carrier (COHEN and DAKIN), T., 1111; P., 1901, 91.
- reducing properties of (DUBOIN), A., ii, 315.
- condition of, in vegetable soils (SCHLESING), A., ii, 471.
- Aluminium alloys** with antimony, density of (VAN AUBEL), A., ii, 453.
- with chromium, effect of various compounds on the periodicity of (OSTWALD), A., ii, 24.
- with copper, iron, cobalt, nickel, manganese, and with platinum (BRUNCK), A., ii, 656.
- with magnesium (BOUDOUARD), A., ii, 512.
- with molybdenum (GUILLET), A., ii, 512, 602.
- with tungsten (GUILLET), A., ii, 388.
- Aluminium ammonio-chlorides** (BAUD), A., ii, 161, 303.
- thermochemistry of (BAUD), A., ii, 224, 303.
- Aluminium bromide**, action of, on acyclic hydrocarbons (POURER), A., i, 305.
- compound of, with bromine and carbon disulphide (PLOTNIKOFF), A., ii, 316.
- chloride, and iodide, preparation of (GUSTAVSON), A., ii, 316.
- and iodide, molecular weight of (KOHLEK), A., ii, 21.
- chloride, catalytic action of (RUFF), A., ii, 500.
- action of, on camphoric anhydride (LEES and PERKIN), T., 332; P., 1898, 111; 1899, 23; 1900, 18; (PERKIN and YATES), T., 1373.
- Aluminium chloride**, action of, on isolauroic acid (LEES and PERKIN), T., 356.
- compound of, with acetic chloride, and its interaction with benzene (BOESEKEN), A., i, 474.
- compounds of, with ammonia (BAUD), A., ii, 161, 303.
- compounds of, with fatty alcohols (PERRIER and POUGET), A., i, 442.
- hydroxide, solubility of, in ammonium salicylate (WOLFF), A., ii, 198.
- oxide (*alumina*), band spectrum of (BERNDT), A., ii, 367.
- in mineral waters (PARMENTIER), A., ii, 516.
- Aluminium organic compounds**, molecular weight of (KOHLEK), A., ii, 21.
- Aluminium, estimation of:**—
- estimation of, in steel (SPATZ), A., ii, 349.
- Amalgams**. See Mercury alloys.
- Amblygonite** from Montelbras (LASNE), A., ii, 455.
- Amides**, true, and the so-called *iso*-amides (HANTZSCH and VORGELEN), A., i, 676.
- formation of (ORTON), T., 1351; P., 1901, 200.
- formation of, from aldehydes (PICKARD and CARTER), T., 520; P., 1901, 45.
- substituted, preparation of, from the corresponding sodamides (TITHERLEY), T., 391; P., 1901, 29.
- Amidosulphuric acid**, action of, on *p*-chloroaniline (PAAL), A., i, 693.
- action of, on piperidine (PAAL and HUBALECK), A., i, 745.
- Amine hydrochlorides**, action of ammonia on (BIDET), A., i, 634.
- Amines** from the reduction of oximes (KONOWALOFF), A., i, 281.
- preparation of, from sodamides, by means of potassium alkyl sulphates (TITHERLEY), T., 399; P., 1901, 30.
- synthesis of, by the aid of alkyl salicylates (TINGLE), A., i, 200.
- action of acetyl bromo- and acetyl-chloro-amino-2:4-dichlorobenzenes on (CHATTAWAY and ORTON), T., 461; P., 1901, 38.
- action of bases and acids on salts of the (COLSON), A., ii, 496.
- condensation products of, with aldehydes (HANTZSCH and SCHWAB), A., i, 378.
- condensation products of, with form-aldehyde (GOLDSCHMIDT), A., i, 652.
- condensation of, with hydroxybenzyl haloids (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 713.

- Amines**, combination of, with lithium chloride (BONNEFOI), A., ii, 653.
 aromatic, direct production of, from the hydrocarbon (GRAEBE), A., i, 523.
 new method of preparing, from and nitro-compounds (SABATIER SENDERENS), A., i, 638.
 electrochemical reduction of nitro-compounds to (ELES and SILBERMANN), A., i, 459; (CHILESOTTI), A., i, 587; (BOEHRINGER & SONS), A., i, 684.
 action of, on substituted aminobenzenes in presence of sulphuric acid (LEMOULT), A., i, 425.
 compounds of, with metallic salts (TOMBECK), A., i, 135, 164, 266.
 reaction of, with wood (COVELLI), A., ii, 705.
 phosphates of, and the dependence of their formation and stability on their composition and structure (RAIKOW and SCHARBANOW), A., i, 319.
 sulphur derivatives of (EDINGER), A., i, 166; (EDINGER and ARNOLD), A., i, 753.
 thiosulphonic acids of (CLAYTON ANILINE Co.), A., i, 694.
 primary, and their sulphonic acids, condensation of, with aromatic aldehydes (WALTER), A., i, 694.
 action of, on mucobromic and mucochloric acids (SIMONIS), A., i, 268.
 tertiary (HAEUSSERMANN), A., i, 229.
 fatty, action of hydrogen peroxide on (MAMLOCK and WOLFFENSTEIN), A., i, 673.
 primary, boiling points of the series of (HENRY), A., i, 128.
 action of nitroso-acylamines on (APITZSCH), A., i, 138.
 condensation of, with β -naphthol and aldehydes (BETTI), A., i, 81, 611, 753; (BETTI and SPERONI), A., i, 81, 778.
 primary and secondary, diagnosis of (HINSBERG), A., i, 128.
 primary, secondary and tertiary, action of *p*-xylylene bromide on (MANOUKIAN), A., i, 528.
 secondary, formation of (DUNSTAN and GOLDBINE), T., 629; P. 1901, 84.
 tertiary, limits of combination in (WEDEKIND), A., i, 639.
 action of α -chlorohydrin on, and bases from (BIENENTHAL), A., i, 128.
- Amines**. See also:—
 Acetophenoneaminophenylguanidine salts.
m-Acetylaminodimethyl-*p*-toluidine.
 4'-Acetylaminodi-phenylamine.
 Acetylenetriphenyltri-amine.
 Acetyl-*o*-phenylenediamine.
p-Alkyloxybenzylanilines.
 Amylamine.
 Anhydroformaldehydeaniline.
 Aniline.
 Anilinobenzene.
 Anilino-4:5-dimethylpyrimidine, amino-.
 3-Anilinodiphenylfluorindine.
 Anilinoguanidine.
 5-Anilino-7-methylnaphthaphenazonium salts.
 Anilinocyclopentene.
 Anilinophenylthiodiazole.
 Anilino-*o*-posafrafranine.
o-Anisidine.
 Anisole, triamino-.
 Anisylanilinourazole.
 10-Anthramine.
 Arylamines.
 Arylhydroxylamines.
 Benzaldehyde-*p*-bromo- and -*p*-chloro-aniline.
 Benzamidine.
 Benzhydrylamine.
 Benzidine.
 Benzoylbenzylamine.
 Benzoylethylideneaniline.
 Benzoyltoluidides, *o*-amino-.
o-Benzoyl-*m*-xylylide, *o*-amino-.
 Benzylamine.
 Benzylaniline.
 Benzylantipyrine, amino-.
 Benzylidihydroisindole, *o*-amino-.
 Benzylethylaniline.
 Benzylhydrindamine.
 β -Benzylhydroxylamine.
 Benzylidenaminophenanthrene.
 Benzylidenaminophenylguanidine salts.
 Benzylideneaniline.
 Benzylidene-*p*-anisidine.
 Benzylidenecbenzamidine.
 Benzylidenebisaminothiazole.
 Benzylidenedianiline.
 Benzylidene-1-methylazimino-*m*-toluidine.
 Benzylidene-*o*-phenetidine.
 Benzylidene-*p*-toluidine.
 Benzyltoluidines.
 Bisdinaphthaxanthoneamine.
 Brassamine.
 Butane, $\alpha\gamma$ -diamino-.
 Butane, $\beta\gamma$ -bromoamino-.
d-sec. Butylamine.
 Butylidenedianiline.

Amines. See:—

*iso*Butylramidine.
 Camphene, 1-amino-.
 Carbanilinodi- α -naphthylethylene-
 diamine.
 Chloralaminophenylguanidine nitrate.
 Citralaminophenylguanidine salts.
 ψ -Cumidine.
 Cytisine, amino-.
m-Dialkylaminoalkoxybenzenes.
 Diamines.
 2:6-Dianilino-4:5-dimethylpyrimidin-
 ine.
 3:10-Dianilinodiphenylfluorindine.
 Dibenzylamine.
 Dibenzyl-*p*-toluidine.
 Di*iso*butylamine.
 Dicarbaminodi- ψ -cumylethylenedi-
 amine.
 Dicarbaminodiphenylethylene-
 diamine.
 Dicarbaminoditolylethylenedi-
 amines.
 Dicarbaminodixylylethylenediamine.
 Di- ψ -cumylethylenediamine.
 Dihydro*iso*indole, 5-amino-.
 Dihydroxydiethylyl*iso*amylamine.
 Dihydroxydiethylbutylamines.
 Dihydroxydiethylheptylamine.
 Dihydroxydiethylhexylamine.
 Dihydroxydiethylpropylamines.
p-Dihydroxydiphenyl-4:6-*dinitro*-1:3-
 phenylenediamine.
 Dimethylaminocycloheptane.
 Dimethylaminocycloheptenes.
p-Dimethylaminophenylaminobenzyl
 cyanide.
 Dimethylaniline.
 Dimethylanilinephthalein, amino-.
 Dimethyldiazaminotoluene.
 Dimethyldiethyl*tetrachlororhodamine*.
 3:7-Dimethyl-5-phenylacridine, 2:8-
diamino-.
s-Dimethyl-*o*-phenylenediamine.
 2:4-Dimethylphenylhydroxylamine.
 2:4-Dimethylpyridine, 6-amino-.
 4:5-Dimethylpyrimidine, amino-.
 Dimethylthujylamine.
 Dimethyl-*m*-toluidine-*p*-aniso-
 le.
 Dimethyltoluidines.
 Di- α -naphthylethylenediamine.
 2:6-Dioxy-1:3-dimethylpyrimidine,
 amino-.
 2:6-Dioxy-3-methylpyrimidine,
 amino-.
 2:5-Dioxy-3-phenylpurine, 7-amino-.
 Diphenylamine.
 Diphenylamine, amino-.
 3:3'-Diphenylbenzidine.
 $\alpha\beta$ -Diphenyl- γ -benzylhydroxyamidine.
 $\alpha\delta$ -Diphenyl- $\alpha\gamma$ -butadiene, di-*p*-
 amino-.

Amines. See:—

Diphenylethylenediamine.
 Diphenylformoguanamine.
s-Diphenyl-*p*-nitrobenzenylamidine.
 Diphenyl-*p*-phenylenediamine.
 Diphenylpiperidylethylenylamidine.
 1:4-Diphenyl-5-thio-1:2:4-triazolone-
 hydrothiamine.
 Diphenyl-*m*-toluidine.
 1:4-Diphenyl-1:2:4-triazolonethio-
 aminobenzene.
 Diphenyl-*o*-xylylenemethylenedi-
 amine.
 Dipropylamine.
 5:9-Di-*p*-toluidino-7-*p*-tolynaphtha-
 phenazonium chloride.
 Ditolyethylenediamines.
 Ditolylformoguanamines.
 Di-*p*-tolylsulphonohydroxylamine.
 Di-*p*-tolylsulphonomethylamine.
 Di-*p*-tolyl-*o*-xylylenediamine.
 Di-*p*-tolyl-*o*-xylylenemethylene-
 diamine.
 Di-2:4:5-trimethylbenzylamine.
 Dixylylethylenediamine.
 Elaidamine.
 Ethoxalylacetyl-*p*-nitrobenzamidine.
 Ethylaniline.
 β -Ethyl*sec*.butylhydroxylamine.
 Ethylenediamine.
 Ethylhydroxyethylamine.
 Ethylideneaminophenylguanidine
 nitrate.
 Ethylideneaniline.
 Ethylidenebenzylamine.
 Ethylidenedianiline.
 Ethylidene-*o*-toluidine.
 1:3:5-Ethylxylidine.
 Flavinduline, amino-.
 Fluorene, 2-amino-.
 Formylhexamethoxydimethylene-
 aniline.
 Furfurylideneaminophenylguanidine
 salts.
 Galactosamine.
 α -Gallonaphthylamine.
 Glucamine.
 Glucosamine.
 ψ -Granatylamine.
 Guanamines.
 Δ^2 -cycloheptene, amino-.
 Heptylidenedianiline.
 Hexahydroxyleucaniline.
 Hexamethyl-4:4':4''-triamino-2-hydr-
 oxytriphénylmethane.
 Hexamethyl-4:4':4''-triaminophenyl-
 fluorene.
 Hexamethylenediamine.
 Hexamethylenetetramine.
 Hexane, $\alpha\zeta$ -diamino-.
 Hydrindamine.
 Hydroxyamidines.

Amines. See :—

β -Hydroxy- β -*o*-aminophenyl-2-ethylpyridine.
 2-Hydroxy-3-*o*-aminophenylquinoxaline.
o-Hydroxybenzylideneaminophenylguanidine.
o-Hydroxybenzylideneaniline.
o-Hydroxybenzylidenebenzamidine.
o-Hydroxybenzylidene-*o*-phenetidine.
o-Hydroxybenzylidene-*o*-toluidine.
 Hydroxyethylisoamylamine.
 Hydroxyethylbutylamines.
 Hydroxyethyl-diisoamylamine.
 Hydroxyethyl-diisobutylamine.
 Hydroxyethyldipropylamine.
 Hydroxyethylheptylamine.
 Hydroxyethylhexylamine.
 Hydroxyethylpropylamines.
 Hydroxyhexahydrobenzylamine.
 Hydroxyhydrindene, amino-.
 Hydroxylamine.
 Hydroxylaminoisobutyramidine.
 Hydroxymethylhexahydrobenzyl-aniline.
 Hydroxymethylisopropylhexahydrobenzyl-amines, -aniline, -dimethylamine, and -diethylamine.
 6-Hydroxynaphthaphenazine, 5-amino-.
 6-Hydroxy-2-*p*-nitrophenylpyrimidine-4-carbo-*p*-nitrobenzamidine.
p-Hydroxyphenyl-*m*-tolylamine, *p*-amino-.
 Hydroxytrimethylhexahydrobenzyl-aniline.
 Infracampholene, amino-.
 Melamine.
 Mesitylhydroxylamine.
 2-Methoxy-4-methylpyrimidine, 5-amino-.
 Methylamines.
 Methylaminocycloheptadiene.
 Methylaminophenylthiodiazole.
 Methyl-*o*-aminotoluenes.
 Methylaniline.
 1-Methylaziminochlorotoluidine.
 1-Methylaziminotoluene, amino-.
 Methylbenzylideneaminophenylguanidine.
 Methylcyclobutane, ω -amino-.
 Methyl-dihydroxydiethylamine.
 Methyl-ethylamine.
 Methyl-ethylenediamine.
 β -Methylhydrindene, α -amino-.
 Methylhydroxyethylamine.
 1-Methylnaphthaphenazonium, amino-.
 β -Methylpentane, $\beta\delta$ -diamino-.
 Methylisopropylamine.
 Methylisopropylhexahydrobenzyl-aniline.

Amines. See :—

Methylisopropyltetrahydrobenzyl-dimethylamine.
 Methylisopropyltetrahydrobenzyl-aniline.
 7-Methylpurine, 5-amino-.
 4-Methylpyrimidine, amino-.
 Methyl-*p*-toluidine.
 Methyltolylenediamines.
 Methyltropans.
 Naphthaphenazine, diamino-.
 α -Naphthaquinone-3-phenylenediamines.
 α -Naphthaquinonetetramethyl-diaminodiphenylmethane.
 4-Naphthol-2-tetramethyl-diaminodiphenylmethane, 1-amino-.
 Naphthylamines.
 Naphthylenediamines.
 β -Naphthylethylamine.
 Octane $\alpha\theta$ -diamino-.
 Octomethylenediamine.
 Opianylidene-*p*-hydroxyaniline.
 iso-Oxyazonolonephenylhydrazonone, amino-.
 2-Oxy-3-phenylpurine, amino-.
 1:2:2:5:5-Pentamethylpyrrolidine, 3-amino-.
 Phenanthrene, 9-amino-.
 Phenanthrylamines.
p-Phenetidine.
 Pheno- α -aminoheptamethylene.
 Phenonaphthoxazole, amino-.
 3-Phenyladenine.
 Phenylanilino-*l*-thiodiazolone.
 Phenylanilinourazole.
 Phenylanisidinourazole.
 Phenylbenzenylthioureaphenylamidine.
 Phenylbenziminoozoles, amino-.
 Phenylbenzoxazole, 1-*p*-amino-.
 Phenylbenzylidene-*p*-phenylenediamine.
 β -Phenyl- γ -benzyl- $\alpha\beta$ -naphthylhydroxyamidine.
 Phenyl-dibenzylaminourazole.
 Phenyl-diethylaminourazole.
 1-Phenyl-3:4-dimethylpyrazole, amino-.
 Phenylenediamines.
 o -Phenylenemethyldiamine.
 Phenylguanidine, amino-.
 Phenylhydroxylamine.
 Phenylmethylaninourazole.
 1-Phenyl-3-methyl-4-ethylpyrazole, amino-.
 Phenyl-naphthaphenazonium salts, amino-.
 Phenyl-dinitronaphthylamine.
 β -Phenyl- α -*m*-nitrophenyl- γ -benzylhydroxyamidine.
 9-Phenylphenanthrolines, amino-.

Amines. See:—

Phenyl-*p*-phenylenediamine.
 3-Phenylpurine, amino-.
 Phenylquinoline, 2:3-*diamino*-.
 Phenylrosinduline chloride, 3-amino-.
 Phenyltetrazole, amino-.
 Phenylthiadiazole, amino-.
 Phenyl-*p*-toluinourazoles.
 Phenyl-*p*-tolylamine.
 β -Phenyl- α -*o*-tolyl- γ -benzylhydroxy-
 amide.
 Phenyl *p*-tolyl sulphide, amino-.
 Pinocampylamine.
 Propane, $\alpha\gamma$ -*diamino*-.
 Propane, $\alpha\beta\gamma$ -*triamino*-.
*iso*Propanolamine.
 Propylidenedianiline.
 Purine, 5-amino-.
 Pyrrolidines, amino-.
 Quinonediphenylimide, amino-.
 Rosindone, amino-.
 Rosindulines, amino-.
 Stilbene, amino-.
 Tetradecylacetylene, amino-.
 Tetrahydrobenzylamine.
ac-Tetrahydro- α - and β -naphthyl-
 amines.
 Tetramethyldiaminocycloheptene.
 Tetramethylenemethylamine.
 2:2:5:5-Tetramethylpyrrolidine,
 3-amino-.
 Tetraphenylphenylenediamines.
 Thiophenideneaminothiazoles.
 Thiophenideneaniline.
 Thiophenidene-*p*-toluidine.
p-Tolacylidine-benzamidine and -*p*-
 tolenylamidine.
p-Tolenylamidine.
 Tolidine.
 Toluidines.
 5-*p*-Toluidino-7-*p*-tolyl-naphthaphen-
 azonium 7-chloride.
p-Toluquinoneditolylimide, amino-.
o-Tolylaminobenzyl cyanide.
 Tolylenediamines.
 Tolyphthalide, amino-.
p-Tolylrosinduline, amino-.
p-Tolylsulphonocarbinylaniline.
p-Tolylsulphonohydroxylamine.
 Triethylamine.
 Triethylmelamine.
 Trihydroxyiminotriphenacylamine.
 3:4:5-Trimethoxybenzylmethylamine.
 Trimethylamine.
 2:4:6-Trimethylbenzylidenedianiline.
 2:4:6-Trimethylbenzylidene- ψ -cumid-
 ine.
 Trimethylenecarbonylamine.
 Trimethylenecarboxylic acid, amine of.
 Trimethylenediamine.
 Trimethylhexahydrobenzylaniline.
 Trimethyltetrahydrobenzylaniline.

Amines. See:—

Tripropylamine.
 Tropan.
ac-Undecylene, amino-.
 Urethanophenylacetoxamidine.
*iso*Valeraldehydianiline.
*iso*Valeraldehyde-*p*-toluidine.
 Valerylidenedianiline.
 Vanillidenecaminophenylguanidine
 picrate.
 Xylenehydroxylamines.
 Xylidines.
 Xylenediamines.
 1:3-Xylol 5-oxide, 2:2'-*diamino*-.
Amino-acids (MEYER), A., i, 190.
 formation of, by the hydrolysis of
 casein (FISCHER), A., i, 781.
 from the hydrolysis of silk fibroin
 (FISCHER and SKITA), A., i, 783.
 estimation of the nitrogen of, in urine
 (KRÜGER and SCHMID), A., ii, 290.
 esters (FISCHER), A., i, 192.
 fatty, conversion of, into the corre-
 sponding chloro-acids (JOCHM),
 A., i, 129.
Amino-alcohols, formation of (HENRY),
 A., i, 16, 68; (STRAUSS), A., i, 17;
 (MATTHES), A., i, 259, 513.
 behaviour of (HENRY), A., i, 16.
Amino-compounds, optical inversion of
 (POPE and HARVEY); T., 85; P.,
 1900, 206.
Amino-mercaptans, halogen-substituted
 (EIBNER), A., i, 321.
Ammonia, formation of, by the action of
 pepsin and trypsin on proteids
 (DZIERZGOWSKI and SALASKIN), A.,
 ii, 666.
 synthetical formation of (BAUR), A.,
 ii, 550.
 vapour pressure of aqueous solutions of
 (PERMAN), T., 718; P., 1901, 46.
 influence of sodium sulphate on the
 vapour pressure of aqueous solutions
 of (PERMAN), T., 725; P., 1901,
 47.
 influence of neutral salts on the vapour
 tension of, in aqueous solutions
 (GAUS), A., ii, 7.
 distribution of, between chloroform
 and water, effect of alkali salts on
 the (DAWSON and McCRAE), T.,
 493; P., 1901, 5.
 distribution of, between chloroform
 and aqueous solutions of the alkali
 earths (DAWSON and McCRAE),
 T., 1069; P., 1901, 177.
 distribution of, between chloroform
 and water, and aqueous copper
 sulphate and chloroform at varying
 temperatures (DAWSON and
 McCRAE), T., 1072; P., 1901, 178.

- Ammonia**, action of, on alloys and on metals at high temperatures (BEILBY and HENDERSON), T., 1245; P., 1901, 190.
 reaction of, with chlorine (NOVES and LYON), A., ii, 601.
 action of, on β -chloroallylthiocarbimide (DIXON), T., 554; P., 1901, 49.
 action of, on oxalacetic acid (FENTON and JONES), T., 96; P., 1900, 205.
 liquid, action of, on iodine and on iodine and sodamide (RUFF), A., ii, 16.
 compounds of, with aluminium chloride (BAUD), A., ii, 161, 303.
 compounds of, with boron sulphide and with boron (STOCK and BLIX), A., ii, 650.
 combination of, with lithium chloride (BONNEFOI), A., ii, 653.
 derivatives, conversion of, into ammonium hydroxides in aqueous solutions (BREDIG), A., i, 608.
 detection of, in water, by mercuric chloride (FERRARO), A., ii, 192.
 estimation of, in presence of hydroxylamine and nitrite (SULER), A., ii, 637.
 estimation of, in animal liquids and tissues (NENCKI and ZALESKI), A., ii, 688.
 estimation of, in urine (FOLIN), A., ii, 575.
 estimation of, in waters (WINKLER), A., ii, 627.
 and methylamines, estimation and separation of (QUANTIN), A., ii, 361.
- Ammonio-aluminium chlorides.** See under Aluminium.
- Ammonio-cobalt compounds.** See under Cobalt.
- Ammonio-copper compounds.** See under Copper.
- Ammoniohydroruthenium**, nitroso-compounds, and double salts (BRIZARD), A., ii, 108.
- Ammonio-mercury salts.** See under Mercury.
- Ammonio-nickel salts.** See under Nickel.
- Ammonio-platinum compounds.** See Platinum bases.
- Ammoniotitanium compounds.** See under Titanium.
- Ammonium**, non-existence of, at -95° (RUFF), A., ii, 600, 653.
- Ammonium amalgam** (COEHN), A., ii, 155.
- Ammonium salts**, combination of, with ammonia in aqueous solution (DAVISON and McCRAE), T., 501; P., 1901, 6.
- Ammonium salts**, toxic action of, on plants (COUPIN), A., ii, 122.
- Ammonium bromide**, equivalent of (SCOTT), T., 147; P., 1900, 204.
 chloride from the Crater of Vesuvius, (MATTEUCCI), A., ii, 63.
 equivalent of (SCOTT), T., 154; P., 1900, 205.
 double salt of, with antimony pentachloride (WEINLAND and SCHLEGELMULCH), A., ii, 660.
 molybdenyl chloride (KLASON), A., ii, 162.
 titanichloride (ROSENHEIM and SCHÜTTE), A., ii, 244.
 telluriodate, telluriphosphates and telluriarsenates (WEINLAND and PRAUSE), A., ii, 599.
 nitrogen iodides (RUFF), A., ii, 16.
 molybdates (KLASON), A., ii, 162.
 phosphomolybdate, precipitation of, by molybdate solution containing citric acid (SEYDA), A., ii, 689.
 nitrate, double salts of, with cerium nitrate (DROSSBACH), A., ii, 102.
 nitrite, decomposition of (WEGSCHEIDER), A., ii, 384.
 nitrilopentachloro-osinate (WERNER and DINKLAGE), A., ii, 661.
 sulphate, double salt of, with plumbic sulphate (ELBS and FISCHER), A., ii, 100.
 See also Agricultural Chemistry.
- nickel sulphate**, electrochemical behaviour of (PFANHAUSER), A., ii, 538.
- rhodium alum** (PICCINI and MARINO), A., ii, 392.
- persulphate**, action of silver salts on solutions of (MARSHALL), A., ii, 156.
 oxidising action of, on products of the organism (HUGOUNENQ), A., i, 242.
- nitrosulphate** (DIVERS and HAGA), T., 1094; P., 1901, 164.
 and ammonium barium imidosulphites (DIVERS and OGAWA), T., 1099; P., 1900, 113; 1901, 163.
 thio-oxyarsenate and hydrogen thio-oxyarsenate (McLAUCHLAN), A., ii, 552.
- Ammonium organic compounds**, quaternary, formation of (PINNOW), A., i, 411.
 potassium cyanide (HERTING), A., ii, 534.
- Amperemanometer** (JOB), A., ii, 83, 222.
- Amphopeptone** (SIEGFRIED), A., i, 176; (FRÄNKEL and LANGSTEIN), A., i, 575.
 preparation of pure (MÜHLE), A., i, 492.

Amyl alcohol, use of, in the analysis of fats (EICHORN), A., ii, 48; (HALLPHEN), A., ii, 359.

esterification of, by nitrphthalic acid and anhydride (McKENZIE), T., 1139; P., 1901, 186.

tert. **Amyl alcohol** (*dimethyl-ethylcarbinol*), action of nitric acid on (KONOWALOFF), A., i, 249.

Amyl alcohols in fusel oil, separation of (MARKWALD; MARKWALD and McKENZIE), A., i, 248.

Amyl derivatives, active, rotatory powers of (GUYE), A., i, 442.

ethers and esters, rotation of certain (GUYE), T., 475; P., 1901, 48.

mereaptan and sulphide, thermochemistry of (BERTHELOT), A., ii, 146.

nitrite, action of, on *o*- and *p*-nitrotoluenes, in presence of sodium ethoxide, and on ethyl crotonate (LAPWORTH), T., 1274; P., 1900, 109.

Amylamine, specific heat and latent heat of evaporation of (KAULENBERG), A., ii, 492.

α -Amylanhydracetonebenzil (JAPP and MELDRUM), T., 1041; P., 1901, 176.

iso **Amylanthranilic acid** (MEYER), A., i, 191.

β -Amylbutyric acid, *dithio*-, ethyl ester, and its α -mono- and di-methyl and -ethyl derivatives (POSNER), A., i, 704.

l-iso **Amylconiine** and its salts (HOHENEMSER and WOLFFENSTEIN), A., i, 606.

Amyliscrotonic acid, thio- (POSNER and DEINHARDT), A., i, 704.

Amylene (**β -methyl- β -butylene**), action of hypochlorous acid on (KRASSUSKY), A., i, 247.

γ -chloro- (KRASSUSKY), A., i, 247.

iso **Amylethyl phenyliminothiolcarbonate** (WHEELER and DUSTIN), A., i, 25.

2-isoAmyl-4-ketodihydroquinazoline (GOTTHELF), A., i, 765.

2-d-Amyl- and 2-isoAmyl 3-nitrophthalic acids (McKENZIE), T., 1137; P., 1901, 186.

***p*-Amyloxyphenyl-carbamide and -thio-carbamide** (SPIEGEL and SABBATH), A., i, 534.

β -Amyloxypropionic acid (HAMONET), A., i, 187.

Amylpropionaldehyde (MOUREU and DELANGE), A., i, 581.

Amylpropionic acid. See α -Octinoic acid.

β -Amylsulphone- α -ethylisocrotonic acid (POSNER and CLAUDIUS), A., i, 705.

γ -Amylvaleric acid, *dithio*-, and its ethyl ester (POSNER and DEINHARDT), A., i, 703.

Amyrol, fractional distillation of, and **Amyrolin** and its *dibromide* (v. SODEN and ROJAHN), A., i, 159.

Anæmia experimentally produced, action of iron in (MÜLLER), A., ii, 522.

during gestation (CHARPIN and GUILLEMONAT), A., ii, 611.

Anæsthetics, action of, on dogs and rabbits (WRIGHT), A., ii, 180, 408. influence of, on the respiration of plants (MORKOWIN), A., ii, 331.

Analcite from Point Sal, California (FAIRBANKS), A., ii, 168.

Analysis, blowpipe, tests in (RICHARDS), A., ii, 471.

use of metallic sodium in (PARSONS), A., ii, 423.

electrolytic, apparatus for (MARSHALL), A., ii, 190.

quantitative, tables for the calculation of (SARTORI), A., ii, 574.

method of weighing precipitates without separating them from the liquid (THATCHER), A., ii, 685.

spectrum. See under Photochemistry. toxicological, use of chromyl *dichloride* in destroying organic substances in (PAGE), A., ii, 39.

use of tannic acid for the estimation of alkaloids in (KIPPENBERGER), A., ii, 79.

volumetric, modification of the man-ganimetric method in (GAILHAT), A., ii, 420.

Andalusite, constitution of (ZULKOWSKI), A., ii, 169.

Andromedotoxin (ARCHANGELSKI), A., i, 734.

Andropogon muricatus, oil of (THEU-LIER), A., i, 397.

Anethole, constitution of (BÉHAL and TIFFENEAU), A., i, 273.

action of iodine and yellow mercuric oxide on (BOUGAULT), A., i, 383, 392.

oxidation of, into anisic acid (BOUGAULT), A., i, 324.

colour reaction of (CHAPMAN), A., ii, 77.

Angelic acid. See Pentenoic acid.

Angostura bark, oil and alkaloids from (HARTWICH and GAMPER), A., ii, 70.

Anhalamine, formula of, and its salts and benzoyl derivatives (HEFFTER), A., i, 736.

Anhalonidine, constitution of, and its benzoyl derivatives (HEFFTER), A., i, 737.

- Anhydracetonebenzil**, homologues of (JAPP and MELDRUM), T., 1024; P., 1901, 174.
- Anhydrides**, preparation of simple and compound (TSCHITSCHIBABIN), A., i, 536.
preparation of, by the aid of tertiary amines (WEDEKIND), A., i, 499.
action of zinc ethyl on (GRANICHSTÄDTEN and WERNER), A., i, 518.
higher, preparation of the (KRAFFT and ROSINY), A., i, 113.
mixed (SEVERIN), A., i, 385; (KNOLL & Co.), A., i, 703.
simple and mixed, and action of phenol and phenylhydrazine on (AUTENRIETH), A., i, 185.
- Anhydrite**, formation of, from gypsum (VAN'T HOFF, HINRICHSSEN, and WEIGERT), A., ii, 506.
- Anhydro-2:4-dimethyl- ψ -quinol-*p*-nitrophenylhydrazone and-senicarbazone** (BAMBERGER and BRADY), A., i, 143.
- Anhydrodimethyltetramethylenetricarboxylic acid** (PERKIN and THORPE), T., 770.
- Anhydro-*p*-ethoxyaminobenzyl alcohol** (GOLDSCHMIDT), A., i, 322.
- Anhydroformaldehydeaniline hydrogen and sodium hydrogen sulphites** (EIBNER), A., i, 377.
- Anhydro-*p*-nitrobenzeneazoacetonedicarboxylic acid**, and its ethyl ester and salts (BÜLOW and HÖPFNER), A., i, 240.
- Anhydrotetronic acid**, condensation of, with aldehydes (WOLFF), A., i, 284.
- Anil**, chloro- and bromo-, compounds of, with pyridine and 3-methylpyridine (IMBERT), A., i, 651.
- Aniladiacetic-*o*-carboxylic acid**, and its trimethyl ester, and the action of sodium ethoxide on the ester (VORLÄNDER and MÜMME), A., i, 83.
- Anilic acid**, bromo-, chloro-, and nitro-, energy of (COFFETTI), A., i, 29.
bromo- and chloro-, and their alkali salts, absorption spectra of (FIORINI), A., ii, 367.
chloro-, thermochemistry of (VALEUR), A., i, 154.
- Anilic acid benzoquinone**, nitro- (SCHMIDT), A., i, 88.
- Aniline**, new method of preparing (SABATIER and SENDERENS), A., i, 638.
new synthesis of (JAUBERT), A., i, 320.
latent heat of vaporisation and specific heat of (LUGININ), A., ii, 145.
composition of the vapour phase of the systems water and, and water, phenol, and (SCHREINEMAKERS), A., ii, 57.
- Aniline**, acetylation of (SUDBOROUGH), T., 536; P., 1901, 45.
oxidation of (BÖRNSTEIN), A., i, 375.
and its mono-, di-, and tri-substituted derivatives, action of acetylchloro-amino-2:4-dichlorobenzene on (CHATTAWAY and ORTON), T., 464; P., 1901, 38.
condensation of, with isobutaldol and isobutaldehyde (FRIEDJUNG and MOSSLER), A., i, 641.
action of, on β -chloroallylthiocarbimide (DIXON), T., 557; P., 1901, 49.
action of, on ethyl acetonedicarboxylate (BESTHORN and GARBEN), A., i, 78.
action of methylene chlorohydrin on (GRASSI-CRISTALDI and SCHIAVOLENI), A., i, 55.
interaction of, with nitrobenzene in presence of alkalis (WOHL and AUE), A., i, 612.
action of, on oxalacetic acid (FENTON and JONES), T., 97; P., 1900, 205.
interaction of, with *p*-tolylurethane (DIXON), T., 104; P., 1900, 208.
compounds of, with metallic salts (TOMBECK), A., i, 135, 266.
bismuth chlorides and antimony chlorides and iodide (SCHIFF), A., i, 375.
chloroacetyl, phenylsulphonacetyl, *p*-tolylsulphonacetyl, thiodiglycolyl, sulphonodiacetyl, cyanoacetyl and thiocynoacetyl derivatives of (GROTHE), A., i, 79, 80.
titanichloride (ROSENHEIM and SCHÜTTE), A., ii, 245.
- Aniline**, 2:6-dibromo-, acetylation of (SUDBOROUGH), T., 541; P., 1901, 45.
o-chloro-, preparation of (CHATTAWAY and ORTON), T., 469; P., 1901, 39.
p-chloro-, action of amidosulphuric acid on (PAAL), A., i, 693.
isomeric chlorobromo-derivatives of (CHATTAWAY and ORTON), T., 816; P., 1901, 124.
formation of (CHATTAWAY and ORTON), T., 822; P., 1901, 125.
chlorodibromo- and dichlorobromo-derivatives of (HURTLEY), T., 1295; P., 1901, 192.
nitro-, reduction of, by hyposulphurous acid (GOLDBERGER), A., i, 23.
o- and *p*-nitro-, electrolytic reduction of (ROHDE), A., i, 136.
- Anilines**, replacement of bromine by chlorine in (CHATTAWAY and ORTON), T., 822; P., 1901, 125.
substituted, some reactions of (OECHSNER DE CONINCK), A., i, 80.

- Anilineaminosulphonic acid**, *p*-chloro- (PAAL), A., i, 693.
- Aniline-black** and its reactions (BÖRNSTEIN), A., i, 399.
- Aniline-orange**, detection of, in milk (LYTHGOE), A., ii, 139.
- Anilinesulphonic acids**, *p*-chloro- and their salts (PAAL), A., i, 693.
- Aniline-*o*- and -*p*-thiosulphonic acids** (CLAYTON ANILINE Co.), A., i, 694.
- β -Anilinoacrylic acid**, α -cyano-, esters (DE BOLLEMONT), A., i, 131.
- Anilino benzene**, bromodinitro- (JACKSON and COHOE), A., i, 585.
- Anilino diacetic acid**, oxidation of (VORLANDER), A., i, 454; (VORLÄNDER and MUMME), A., i, 463.
- Anilino dibenzoyl ethane** (PAAL and SCHULZE), A., i, 154.
- Anilino-4:5-dimethylpyrimidines**, 6- and 2-, and their amino-derivatives and salts (SCHLENKER), A., i, 763.
- 3-Anilino diphenylfluorindine** and its hydrochloride (KEHRMANN and GUGGENHEIM), A., i, 422.
- β -Anilino glutaric acid**, ethyl ester and its anilide (BESTHORN and GARBEN), A., i, 78.
- Anilino guanidine** and its isomeride, reactions of, and compound of, with ethyl acetoacetate (PELLIZZARI and RONCAGLIOLI), A., i, 768.
- Anilino methylenedihydroisophorone** (FARBWERKEFORM. MEISTER, LUCIUS, & BRÜNING), A., i, 692.
- Anilino methylmethylenecyclohexanone** (FARBWERKEFORM. MEISTER, LUCIUS, & BRÜNING), A., i, 692.
- 5-Anilino-7-methylnaphthaphenazonium salts**, 9-chloro- (KEHRMANN and MÜLLER), A., i, 419.
- Anilino-oxalyldimethylacetoacetic acid**, methyl ester (CONRAD), A., i, 65.
- Anilino cyclopentene** and its isomeride, and their salts, and its acetyl and benzoyl derivatives (NOELDECHEN), A., i, 61.
- Anilino phenylthiodiazole** and its silver derivative (YOUNG and EYRE), T., 60; P., 1900, 189.
- Anilino phosphoryl chloride** (CAVEN), P., 1901, 27.
- 2-Anilino-5-isopropyl-1:4-benzoquinone**, 3:6-dibromo- (HOFFMANN), A., ii, 474.
- Anilino aposafranin** and chloride, chloro- (KEHRMANN and GUGGENHEIM), A., i, 421.
- Anilino-*p*-toluidio-phosphoric acid**, ethyl ester, and -phosphoryl chloride (CAVEN), P., 1901, 26.
- 4-Anilino-1-*p*-tolylurazole** (BUSCH and GROHMANN), A., i, 617.
- Anilopyrine** and action of nitric acid and of methyl iodide on (MICHAELIS and GUNKEL), A., i, 351.
- Anil trimethylsuccinic acids**, *d*- and *l*- (PAOLINI), A., i, 253.
- Animal charcoal** (*bone black*), sulphides in (STOLLE), A., ii, 154.
- detection of mineral phosphates in (V. LORENZ), A., ii, 193.
- heat, influence of digestion on (REICHERT), A., ii, 28.
- juices and tissues, chemico-physical relations of (OKER-BLOM), A., ii, 326, 520.
- liquid, obtained by tapping, composition of an (MALMÉJAC), A., ii, 520.
- liquids and tissues, estimation of ammonia in (NENCKI and ZALESKI), A., ii, 688.
- Animals**, influence of sterilised air on (KIJANITZIN), A., ii, 115.
- starving, properties of pancreatic juice in (WERTHEIMER; CANUS and GLEY), A., ii, 324.
- iso***Anisaldoxime** mesityl ether (BAMBERGER and RISING), A., i, 142.
- Anis hydroxamic acid** (ANGELICO and FANARA), A., i, 708.
- Anisic acid**, conversion of anethole into, by oxidation (BOUGAULT), A., i, 324.
- o*-**Anisidine**, nitro-derivatives, and their acetyl derivatives (FREYSS), A., i, 321.
- and their benzoyl derivatives, constitution of (MELDOLA and EYRE), P., 1901, 133.
- 4:5-dinitro-, constitution and diazotisation of (MELDOLA and EYRE), T., 1076; P., 1901, 131, 185.
- Anisole**, latent heat of vaporisation and specific heat of (LUGININ), A., ii, 145.
- 3:4:6-*tri*amino-, and its acetyl derivative, and the diphenylazines from (MELDOLA and EYRE), T., 1076; P., 1901, 131, 185.
- Anisylanilino urazole** and its isomeride (BUSCH), A., i, 489.
- Anisyl mercuric iodides** (DIMROTH), A., i, 440.
- Anisyl methyl ketone**, selenium derivative of (KUNCKELL and ZIMMERMANN), A., i, 215.
- Anisylideneacetophenone**, bromo-, and its compounds with ethyl, methyl, and propyl alcohols (POND and SHOFFSTALL), A., i, 35.
- Anisyl nitro-formaldehyde phenylhydrazones** and -methane (BAMBERGER and SCHEUTZ), A., i, 548.
- o*-**Anisyl phenyl diguanide** and its nitrate (CRAMER), A., i, 772.

- Ankerite** from Magdeburg (FAHRENHORST), A., ii, 248.
- Annelids**, respiration in (BOUNHOL), A., ii, 517.
- Anniversary dinner**, P., 1901, 75.
- Annual General Meeting**, T., 871 ; P., 1901, 70.
- Anorthite** crystals from Franklin Furnace, New Jersey (WARREN), A., ii, 455.
- Anorthoclase** from Christiania district (BRÜGGER), A., ii, 170.
- Anthophaein**, the brown colouring matter of flowers (MÖBIUS), A., i, 221.
- Anthracene**, action of sulphur *monochloride* on (LIPPMANN and POLLAK), A., i, 690.
 derivatives, dyeing properties of (LIEBERMANN), A., i, 478 ; (BUNTROCK), A., i, 602.
 nitro-acetate and -chloride (DIMROTH), A., i, 197.
dithiochloride (LIPPMANN and POLLAK), A., i, 690.
- Anthracene**, 10-nitro- (MEISENHEIMER), A., i, 135 ; (DIMROTH), A., i, 197.
- Anthrachryson-2:6-disulphonic acid**, 4:8-diamino-, formation of (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 729.
- Anthraquinones** and their imides, transformation of, into hydroxyanthraquinones and their amino-derivatives (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 729.
- Anthragallol**, autoxidation products of (BAMBERGER and PRAETORIUS), A., i, 730.
- 10-Anthramine** and its acetyl derivative (MEISENHEIMER), A., i, 135.
- Anthranilic acid** (*o-aminobenzoic acid*), action of formaldehyde and nascent hydrogen cyanide on (KÖHNER), A., i, 537.
 derivatives (MEHNER), A., i, 470, 644.
 conversion of, into indigo (ERDMANN), A., i, 536.
- Anthranilic acid**, esters (GOLDSCHMIDT), A., i, 709.
 methyl ester (E. and H. ERDMANN), A., i, 709.
 action of formaldehyde on (MEHNER), A., i, 470 ; (ERDMANN), A., i, 536, 591.
 estimation of, in essential oils (HESSE and ZEITSCHSEL), A., ii, 209.
- Anthranilic acid**, 6-chloro-, and its hydrochloride (COHN), A., i, 637.
 3:4-dichloro- (FERRANI), A., i, 637.
- Anthranilic acid** and its 3:6-dichloro- and dibromo- (BAMBERGER and DEMUTH), A., i, 392.
 3:5:6-trichloro- (GRAEBE and ROSTOWZEW), A., i, 544.
- Anthranilidoacetoneitrile**. See Methylaminobenzoic acid, *o*-cyano-.
- Anthraphenone**, preparation of (LIPPMANN and KEPPICH), A., i, 37 ; (LIPPMANN and POLLAK), A., i, 728.
 nitro- (LIPPMANN and KEPPICH), A., i, 37.
- Anthrapurpurin** diacetate (KNOLL & Co.), A., i, 730.
- Anthraquinone** derivatives, dyeing properties of (LIEBERMANN), A., i, 478.
- Anthraquinone**, 1:2:4-trichloro- (GRAEBE and ROSTOWZEW), A., i, 544.
o-nitro-, electrolytic reduction of, to the *o*-amino-derivative (MÖLLER), A., i, 598, 646.
 1:5- and *α-di*-nitro-, electrolytic reduction of (MÖLLER), A., i, 646.
- β-Anthraquinonesulphone-methylanilide** and -*n*-heptylamide (HINSBERG), A., i, 128.
- Anti-coagulating agents** (PICK and SPIRO), A., ii, 117.
- Antimony**, atomic weight of (FRIEND and SMITH), A., ii, 604.
 conversion of arsenic into (FITTICA), A., ii, 236, 313 ; (ARNOLD and MURACH), A., ii, 236.
 conversion of phosphorus into (FITTICA), A., ii, 59.
 melting point of (HOLBORN and DAY), A., ii, 85.
 localisation and dissemination of, in the organism (POUCHET), A., ii, 673.
- Antimony alloy** with aluminium, density of (VAN AUBEL), A., ii, 453.
- Antimony tribromide**, cryoscopic experiments with (GARELLI and BASANI), A., ii, 373.
 and trichloride, dissociating power and latent heat of fusion of (TOLLOCZKO), A., ii, 437.
 caesium bromide and chloride (WELLS and METZGER), A., ii, 661.
 trichloride and triiodide, compounds of, with aniline (SCHIFF), A., i, 375.
 pentachloride, dissociation of (NOTHOMB), A., ii, 88.
 double salts of, with the chlorides of ammonium, calcium, magnesium and potassium (WEINLAND and SCHLEGELMILCH), A., ii, 660.
 caesium fluorides and iodide (WELLS and METZGER), A., ii, 514.
 haloids, action of boron bromide on (TARIBLE), A., ii, 153.

- Antimony hydride**, preparation of pure (STOCK and DOHT), A., ii, 556.
- Antimonic acid**, estimation of, iodometrically (ROHMER), A., ii, 479.
- Tri- and Tetra-antimonic acids** and their salts (DELACROIX), A., ii, 318.
- Antimony**, detection and estimation of:—
detection of, in presence of sulphites, etc. (SMITH), A., ii, 279.
estimation of, in cupreous materials (GIBB), A., ii, 345.
estimation of, in presence of tin (ROHMER), A., ii, 479.
separation of, electrolytically, from tin (OST and KLAPPROTH), A., ii, 695.
- Antimony-phosphorus-arsenic group**, replacements in the (KRAFFT and NEUMANN), A., ii, 235.
- Antipeptone** (SIEGFRIED), A., i, 57, 176; (KUTSCHER), A., i, 108, 354.
- Antipyrine** (1-phenyl-2:3-dimethylpyrazolone), derivatives of (EERT and REUTER), A., i, 294.
excretion of (LAWROFF), A., ii, 463.
detection of, in urine (PETERMANN), A., ii, 293.
- Antipyrine**, thio-. See Thiopyrine.
- Antiseptic**, sodium mercuriphenoldisulphonate as an (A. and L. LUMIÈRE and CHEVROTIER), A., i, 244.
- Apatite** from Ceylon (SCHIFFER), A., ii, 111.
- Apigenin**, an isomeride of (v. KOSTANECKI and WEBEL), A., i, 479.
acetyl and methyl derivatives of (CONTI and TESTONI), A., i, 399.
methyl ether and its diaetyl derivative (VONGERICHTEN), A., i, 40.
- Apiin** and its hydrolysis (VONGERICHTEN), A., i, 646.
hydrolysis of (CONTI and TESTONI), A., i, 398.
action of aqueous potassium hydroxide and methyl iodide on, and its methyl ether (VONGERICHTEN), A., i, 40.
- Apiole**, a reaction of (JORISSEN), A., ii, 205.
- Apiose** and its osazone and *p*-bromophenylosazone (VONGERICHTEN), A., i, 646.
- Apiosedextrosephloroglucinol** and its hydrolysis and the action of benzenediazonium chloride on (VONGERICHTEN), A., i, 647.
- Apnea**, cause of (FREDERICQ), A., ii, 174.
- Apophyllite** from Sulitelma, Scandinavia (HENNIG), A., ii, 112.
- Apples**. See Agricultural Chemistry.
- l-Arabinose**, action of *Bacillus coli communis* on (HARDEN), T., 624; P., 1901, 58.
- Arabinoxes**, behaviour of, in the organism (SALKOWSKI; NEUBERG and WOHLGEMUTH), A., ii, 521.
- l-Arabinic acid**, oxidation of (RUFF and MEUSSER), A., i, 449.
- Aragonite**, relation of, to conchite (KELLY), A., ii, 168; (BRAUNS), A., ii, 395.
simple method of distinguishing calcite and (MEIGEN), A., ii, 692.
- Arenicola larvæ**, action of various salts on ciliary and muscular movements in (LILLIE), A., ii, 179.
- Arginine**, constitution and oxidation of (BENECH and KUTSCHER), A., i, 403; (KUTSCHER), A., i, 561.
occurrence of, in the spleen (v. GULEWITSCH and JOCHELSOHN), A., ii, 29.
- d-Arginine**, conversion of, into its inactive isomeride (KUTSCHER), A., i, 561.
- Argon**, separation and spectra of (LIVING and DEWAR), A., ii, 598.
refraction of (RAMSAY), A., ii, 141.
physical properties of (RAMSAY and TRAVERS), A., ii, 237.
- Argonides**, presence of, in crystalline rocks (GAUTIER), A., ii, 398.
- Aromatic compounds**, bromination of (BRUNER), A., ii, 441.
- Arrhenatherum bulbosum*, graminin in the root swellings of (HARLAY), A., ii, 267.
- Arsenic**, preparation of, free from antimony (ORLOFF), A., ii, 313.
alleged conversion of phosphorus into (CHRISTOMANOS; FITTICA), A., ii, 59.
alleged conversion of, into antimony (FITTICA), A., ii, 236, 313; (ARNOLD and MURACH), A., ii, 236.
in the organs of the body (HÖDLMOSER), A., ii, 673.
- Arsenic tribromide**, dissociating power of (TOLLOCZKO), A., ii, 437.
cryoscopic experiments with (GARELLI and BASSANI), A., ii, 373.
haloids, action of boron bromide on (TARBLE), A., ii, 153.
trihydride (*arsine*, *hydrogen arsenide*), heat of formation of (DE FORCRAND), A., ii, 641.
action of, on boron bromide (STOCK), A., ii, 382.
- Arsenides**, presence of, in crystalline rocks (GAUTIER), A., ii, 398.
- Arsenic triiodide**, commercial, and test for (DUPOUY), A., ii, 17.

Arsenic:—

- Arsenious oxide**, rate of solution of (DRUCKER), A., ii, 230, 376.
behaviour of, towards permanganate (KÜLLING), A., ii, 237.
- Arsenic acid**, acidimetry of (ASTRUC and TARBOUTRECH), A., ii, 552.
- Thio-oxyarsenic acids**, preparation of (McCAY), A., ii, 95; (WEINLAND and LEHMANN), A., ii, 313; (McLAUCHLAN), A., ii, 552.
- Thioarsenates**, detection of, in presence of thio-oxyarsenates (WEINLAND and LEHMANN), A., ii, 314.
- Arsenic disulphide**, action of hydrogen on (PÉLABON), A., ii, 313.
- pentasulphide**, action of sodium ethoxide and alkalis on (WEINLAND and LEHMANN), A., ii, 313.
action of alkali hydroxides and alkaline earths on (McCAY), A., ii, 95; (WEINLAND and LEHMANN), A., ii, 313.
- Arsenic**, detection, estimation, and separation of:—
Gutzeit's test for (BIRD), A., ii, 576.
modification of Gutzeit's test for (DOWZARD), T., 715; P., 1901, 92.
effect on the Marsh test of some commercial products containing selenium and tellurium (BERRY), A., ii, 423.
influence of selenium on the tests for (ROSENHEIM), A., ii, 531.
test for, by *Penicillium brevicaulis* (MARPMANN), A., ii, 125; (GALLI-VALERIO and STRYZOWSKI), A., ii, 194.
test for, in beers and brewing materials (CHAPMAN; ALLEN; REPORT OF THE COMMISSION TO THE MANCHESTER BREWERS' CENTRAL ASSOCIATION), A., ii, 125.
detection of, in beers, brewing materials, and food (THOMSON and SHENTON), A., ii, 345.
detection of, in the presence of sulphites, etc. (SMITH), A., ii, 279.
detection of, in waters (GOSIO), A., ii, 193.
detection of nitrogen in (CHRISTOMANOS), A., ii, 59; (FITTICA), A., ii, 59, 236, 313; (ARNOLD and MURACH), A., ii, 236.
estimation of (DUCRU), A., ii, 73, 243.
estimation of, as ammonium magnesium arsenate (DUCRU), A., ii, 125.
estimation of, in beer (JONES; RYDER and GREENWOOD), A., ii, 280.
estimation of, in coal and coke (SMITH and JENKS; ARCHBUTT and JACKSON), A., ii, 476; (CHAPMAN), A., ii, 690.

- Arsenic**, estimation and separation of:—
estimation of, in cupreous materials (GIBB), A., ii, 345.
estimation of, in London purple (HAYWOOD), A., ii, 126.
estimation of, in tiles, dust, &c., from malt kilns (FAIRLEY), A., ii, 577.
estimation of, in Paris green (AVERY and BEANS), A., ii, 346, 623.
separation of (ROHMER), A., ii, 194.
- Arsenic-antimony-phosphorus group**, replacements in the (KRAFFT and NEUMANN), A., ii, 235.
- Arsenic mould** (*Penicillium brevicaulis*) as a test for arsenic (MARPMANN), A., ii, 125; (GALLI-VALERIO and STRYZOWSKI), A., ii, 194.
gas evolved by (BIGINELLI), A., i, 20.
use of, for the detection of arsenic in waters (GOSIO), A., ii, 193.
- Arsenical gas** from wall-paper (BIGINELLI), A., i, 20.
- Artemisin** and its salts, oxime, and compound with chloroform (BERTOLO), A., i, 718.
- Arum maculatum*, chemical processes in the juice of (HAHN), A., ii, 121.
- Aryl carbonates**, preparation of (FARBEN-FABRIKEN VORM. F. BAYER & Co.), A., i, 662.
potassium sulphates, preparation of (VERLEY), A., i, 143.
- Arylamines**, acetylation of (SUDBOROUGH), T., 533; P., 1901, 45.
isodiazotisation of (BAMBERGER and RÜST), A., i, 171.
- Arylhydroxylamines**, mechanism of the conversion of, into aminophenols (BAMBERGER), A., i, 140, 203.
- Arylthiosulphonates** of organic bases (TRÜGER and LINDE), A., i, 337.
- Asbestos** from Alilovci, Sauskimost (GRIMMER), A., ii, 561.
- Ashes**, estimation of phosphoric acid in (v. LORENZ), A., ii, 278.
See also Agricultural Chemistry.
- Asparagine**, formation of, in plants (SCHULZE), A., ii, 184, 332, 467.
oxidation of (JOLLES), A., i, 262.
as a foodstuff (ROSENFELD), A., ii, 177.
- Asparaginic acid**, reduction of, by *Bacillus coli communis*, in presence of glucose and mannitol (HARDEN), T., 623; P., 1901, 58.
- Aspartic acid**, free, in *Tritonium nodosum* (HENZE), A., ii, 178.
oxidation of (JOLLES), A., i, 262.
- Aspartic acid**, *l*-diethyl ester (FISCHER), A., i, 193.

- Aspergillus niger*, action of copper and zinc on (RICHTER), A., ii, 567.
 protease of (MALFITANO), A., i, 58.
 tannase of (FERNBACH; POTTEVIN), A., i, 179.
- Asphalts**, comparative method for determining the fusing points of (MABERY and SIEPLEIN), A., ii, 352.
- Asphyxia**, influence of, on the glycogenic function of the liver (SEEGEN), A., ii, 522.
- Aspicillin** (HESSE), A., i, 152.
- Aspidospermine**, reaction of, with perchloric acid (HAEUSSERMANN and SIGEL), A., ii, 124.
- Aspirin**, physiological action of (SINGER), A., ii, 408.
- Atmospheric air**, volumetric composition of; lecture experiment (ROSENFELD), A., ii, 547.
 electrical conductivity of (WILSON), A., ii, 490.
 ionisation of (WILSON), A., ii, 435.
 combustible gases of (GAUTIER), A., ii, 14, 92, 171, 232.
 separation of hydrogen, helium, neon, krypton, and xenon from (DEWAR), A., ii, 597.
 distribution of sulphuric acid in (OST), A., ii, 15.
 liquid, surface tension of (GRUNMACH), A., ii, 646.
 gaseous exchanges between plants and (SCHLESING), A., ii, 31.
 expired, toxicity of (FORMÁNEK), A., ii, 174.
 sterilised, influence of, on animals (KIJANITZIN), A., ii, 115.
 detection of carbon monoxide in (ZUNTZ and KOSTIN), A., ii, 280; (KOSTIN), A., ii, 281.
 estimation of, in water (PELLET), A., ii, 75.
 estimation of carbon dioxide in (HALDANE), A., ii, 477.
- Atomic weight**, relation between atomic volume, melting point and (BAYLEY), A., ii, 497.
 and magnetism (ERRERA), A., ii, 83.
 of antimony (FRIEND and SMITH), A., ii, 604.
 of calcium (HERZFELD and STIEFEL), A., ii, 239.
 of indium (BENOIST), A., ii, 308.
 of lanthanum (BRAUNER and PAVLÍČEK), P., 1901, 63.
 of neodymium (BRAUNER), P., 1901, 66.
 of nitrogen (SCOTT), T., 147; P., 1900, 204.
 of praseodymium (BRAUNER), P., 1901, 65.
- Atomic weight** of tellurium (STEINER), A., ii, 236.
 of uranium (ALOY), A., ii, 244.
 of ytterbium and yttrium (G. and E. URBAIN), A., ii, 161.
- Atomic weights**, report of the American Committee on (CLARKE), A., ii, 379.
 the standard of (BRAUNER), A., ii, 231; (ERDMANN), A., ii, 379.
 tendency of, to approximate to whole numbers (STRUTT), A., ii, 308.
 determination of, based on the laws of the transparency of matter for X-rays (BENOIST), A., ii, 215, 216, 308; (HÉBERT and REYNAUD), A., ii, 215.
- Atoms**, theory of the behaviour of (MARTIN), P., 1901, 169.
- Atropine**, formation of, from hyoscyamine (MAZZUCHELLI), A., i, 161.
 relation of, to hyoscyamine (GADAMER), A., i, 605.
 decomposition of, in the organism (WIECHOWSKI), A., ii, 615.
 microchemical reaction of (SCHOORL), A., ii, 707.
- Augite** from Point Sal, California (FAIRBANKS), A., ii, 168.
 from Romania (PONI), A., ii, 26.
- Autofermentation**. See under Fermentation.
- Autolysis** of the lung (JACOBY), A., ii, 670.
- Auto-oxidation**. See Oxidation.
- Auxochromic groups** containing tertiary nitrogen, law of (LEMOULT), A., i, 232, 351; (BAYRAC and CAMICHEL; CAMICHEL and BAYRAC), A., i, 296.
- Avitellie acid** and its salts (LEVENE and ALSBERG), A., i, 300.
- Avogadro's hypothesis** (PONSOT), A., ii, 542.
- Azelaic acid** (*heptanedicarboxylic acid*) (LE SUEUR), T., 1314; P., 1900, 91.
- Azimethine derivatives**, formation of (WALTER), A., i, 694.
- Azine**, $C_9H_{14}N_4$, obtained by heating diaminomethylpyrimidine with benzil (GABRIEL and COLMAN), A., i, 428.
 derivatives, synthesis of, by means of acetylamino-naphthalic acid (KEHRMANN and BACHE), A., i, 47.
- Azobenzene**, 2:2':4:4'-tetrachloro- (ZINCKE), A., i, 778.
 2:4:6:2':4':6'-hexachloro- (CHATTAWAY and ORTON), T., 467; P., 1901, 39.
di-p-nitro- (DE BRUYN and BLANKSMA), A., i, 460; (BLANKSMA), A., i, 461.
- Azo-compounds**, amino-, characterisation of (MÖHLAU and HEINZE), A., i, 432.

Azo-compounds. See preceding entries and also :—
 Aldazine, $C_{12}H_{20}N_2$.
o-Aldoximophenylazo-*o*-aldoximoidanilide.
 Anhydro-*p*-nitrobenzeneazoacetonedicarboxylic acid.
 Azobenzene.
o-Azodiphenyl.
 Azotoluenes.
 3-Azo-2-toluidine.
 Azoxybenzene.
o-Azoxydiphenyl.
α-Azoxy-naphthalene.
o-Azoxytoluene.
 Azoxyxylenes.
 Benzaldazines.
 Benzeneazoacetonedicarboxylic acid.
 Benzeneazoaminomethylazimino-toluene.
 Benzeneazo-*o*-bromo-*p*-cresol.
 Benzeneazo-*p*-cresol.
 4-Benzeneazo-1:3 (or 5)-diphenyl-5 (or 3)-benzylpyrazole.
 Benzeneazohydroxymethylphenylmercuric acetate.
 Benzeneazohydroxyphenylmercuric salts.
 Benzeneazohydroxytolualdehydes.
 Benzeneazohydroxyxylylides.
 Benzeneazo-*α*-ketoglutarimide.
 Benzeneazo-*β*-naphthol.
 Benzeneazonaphthylleucauramines.
 Benzeneazo-*o*-nitrosalicylic acid.
 Benzeneazophenylacetylacetophenone.
 Benzeneazophenylleucauramine.
 Benzeneazophenyliminomethanethio-methane.
 Benzeneazopyrrole.
 Benzene-4-azoresorcinol.
 Benzeneazoresorcyaldehyde.
 Benzeneazosalicylic acid.
 Benzenediazohydroxylamino-*p*-toluene.
 Benzenediazonium chloride.
 Benzo-*β*-ketopentamethyleneazinecarboxylic acid.
 Bisazoxyacetic acid.
 Bisazoxymethane.
 2:4-Bisbenzeneazoresorcinol.
 Bisdiazomethane.
 Carbaminoazocyanide.
 Carbaminoiminoozomide.
 1-Carbamino-5-pyrazolone-3-*p*-nitrobenzeneazoacetic acid.
 Cumarophenazine.
 Dianisylidazo-*α*-naphthol.
 Diazoacetic acid.
*iso*Diazoacetic acid.
 Diazoaminobenzene-2-carboxylic acid.
 Diazoaminobenzene-2:2'-dicarboxylic acid.

Azo-compounds. See :—
o-Diazoaminobenzoic acid.
 Diazobenzene.
 Diazobenzenephloroglucinol methyl ether.
 Diazobenzenesulphonic acid.
 3-Diazocarbazole.
 Diazo-chlorides.
 Diazo-compounds.
 2-Diazo-fluorene.
 2-Diazo-fluorenone.
 Diazoguanidine.
 Diazomethane.
*iso*Diazomethane.
 Diazonium chlorides.
 Diazoxide.
 Dibenzylazoxime.
 Di-*ψ*-cumylpiperazine.
 4-Diethylaminophenyl-*μ*-cyanoazomethine-4'-nitrophenyl.
 Dihydropyrazines.
 2:5-Dimethylbenzaldazine.
 Dimethyldiazoaminotoluene.
 Dimethyl-*m*-toluidineazobenzene.
 Dimethyl-*m*-toluidineazo-*p*-phenetole.
 Dimethyl-*m*-toluidineazotoluenes.
 Dinaphthaphenazine-furan and -oxazine.
 Dinaphthylsulphonebisdiazo-diphenyl and -ditolyl.
 Diphenylazines.
 Diphenyldiisobutylpiperazine.
 Diphenyldisazo-*α*-naphthol.
 3:6-Diphenylpyridazine.
 Diphenylsulphonebisdiazo-diphenyl and -ditolyl.
 Ditolylsulphonebisdiazo-diphenyl and -ditolyl.
 Dixylylpiperazine.
 Ethoxycumarophenazine.
m-Ethylaminoozobenzenesulphonic acid.
 4-Ethylaminophenyl-*μ*-cyanoazomethinephenyl.
 Glutaric diazomide.
 Guanazoguanazole.
 Hydrazobenzene.
 Hydrazodiphenyls.
 Hydrazotoluene.
 5-Hydroxy-6-anilino-*αβ*-naphthaphenazine.
 Hydroxyazoaldehydes.
 Hydroxyazobenzenes.
 Hydroxyazo-compounds.
m-Hydroxy-*o*-azotoluene.
o-Hydroxybenzeneazo-*p*-toluene.
 Hydroxydinaphthaphenazine oxide.
 2-Hydroxy-1-methyl-3-ketophenylpropenyl-5-benzeneazobenzene.
 2-Hydroxy-5-methylolbenzaldazine.
 Hydroxynaphthaphenazines.
o-Methoxyazobenzene.

Azo-compounds. See:—

- 4-Methylaminophenyl- μ -cyanoazomethinephenyl.
- Methylbenzo- β -ketopentamethylene-azinecarboxylic acid.
- Methylcoumarophenazine.
- Methylenebishydrazobenzene.
- 2-Methyl-5-ethyl- ψ -indophenazine.
- Methyl- $\alpha\beta$ -naphthazine.
- 4-Methylumbelliferone-8-diazo-anhydride.
- 4-Methylumbelliferone-8-diazosulphonic acid.
- α -Naphthaleneazo-*o*-cresol.
- β -Naphthaleneazodiacetylsuccinic acid.
- Naphthaleneazophenol.
- α -Naphthaleneazothymol.
- Naphthaphenazines.
- 1:4:7:10-Naphthatetrazine-2:3:8:9-tetracetic acid.
- β -Naphtholazodiphenylhydrazone-cyanoacetic acid.
- β -Naphthol- β -azophenylbenziminobazoles.
- 5-*iso*Oxazolone-3-*p*-nitrobenzeneazocetic acid.
- o*-Oxyazo-compounds.
- Phenazine.
- Phenylaziminobenzene.
- Phenyl-3-methyl-4-benzeneazo-5-pyrazolone.
- 1-Phenyl-4-*p*-nitrobenzeneazo-5-pyrazolone-3-acetic acid.
- 1-Phenyl-5-pyrazolone-3-*p*-nitrobenzeneazocetic acid.
- Sebacic diazoimide.
- Suberic diazoimide.
- 5-*p*-Sulphobenzeneazo-2-hydroxy-*m*-tolualdehyde.
- s-Tetramethyldinitroazoxymethane.
- 1:2:4:5-Tetraphenylhexahydro-1:2:4:5-tetrazine.
- Tetrazoditolylsulphonic acid.
- p*-Toluneazodiacetylsuccinic acid.
- Toluneazoimides.
- Toluneazo- β -naphthols.
- Toluneazo-*o*-nitrophenols.
- Toluneazophenols.
- p*-Toluneazo-*p*-tolyl-aureamine and leucauramine.
- Tolenediazoaminobenzoic acids.
- p*-Toluenediazohydroxylaminobenzene.
- m*-Toluidinoazobenzoic acid.
- p*-Triazoacetanilide.
- m*-Triazoacetophenone.
- Triazoanisoles.
- Triazobenzaldehydes.
- Triazobenzaldoxime.
- Triazobenzoic acids.
- p*-Triazobromobenzene.

Azo-compounds. See:—

- 2-Triazo-3:5-dimethylbenzaldehyde.
- 2-Triazo-3:5-dimethylbenzoic acid.
- Triazopyrocatechol methylene ether.
- Tricarballic triazoimide.
- Urazognanazole.
- Urazoiminourazole.
- m*-Xyleneazoimide.
- m*-Xylenediazoaminobenzoic acid.
- o*-Azodiphenyl (FRIEBEL and RASSOW), A., i, 575.
- Azo-dyes** from *di-p*-aminodiphenylcyclobutadiene (FREUND), A., i, 711.
- from β -naphthol and the α -naphthylaminemonosulphonic acids (v. GEORGIEVICS), A., i, 239.
- from β -naphthol and the α -naphthylaminemonosulphonic acids, behaviour of, with sheep's wool (v. GEORGIEVICS and SPRINGER), A., i, 239.
- nitro-, reduction of (ROSENSTIEHL), A., i, 429.
- Azoimides**, preparation of (RUPE and v. MAJEWSKI), A., i, 104.
- Azonium dyes**, chloro-derivatives of (KEHRMANN and HIBY), A., i, 418; (KEHRMANN and MÜLLER), A., i, 419; (KEHRMANN and KRAZLER), A., i, 420.
- Azotoluene**, *oo*-dichloro- (COHN), A., i, 638.
- o*-Azotoluene, *p*-diamino-, and its salts (ELBS and SCHWARZ), A., i, 619.
- 3-Azo-2-toluidine** (ROSENSTIEHL), A., i, 429.
- Azonium compounds** (KEHRMANN), A., i, 484.
- Azoxybenzene**, isomeric change of (BAMBERGER), A., i, 107.
- di-m*-nitro- (DE BRUYN and BLANKSMA), A., i, 460; (BLANKSMA), A., i, 461.
- o*-Azoxydiphenyl (FRIEBEL and RASSOW), A., i, 575.
- α -Azoxy-naphthalene (WACKER), A., i, 655.
- o*-Azoxytoluene, *p*-diamino-, and its salts and diacetyl derivative (ELBS and SCHWARZ), A., i, 619.
- as*-Azoxy-*m*-xylene (BAMBERGER and BRADY), A., i, 142.
- Azoxyxylenes** (BAMBERGER and RISING), A., i, 530.

B.

- Bacillus carotovorus* (JONES), A., ii, 264.
- coli communis*, modification of the functions of (GRIMBERT and LEGROS), A., ii, 265.
- action of, on carbohydrates and on formates and lactates (HARDEN), T., 610; P., 1901, 57.

- Bacillus coli communis*, neutral-red as a means of detecting, in water (MAGILL; SAVAGE), A., ii, 696.
- diphtheria, biology and chemistry of (ARONSON), A., ii, 265.
- and pseudo-diphtheria, indole-like reaction of cultures of (HEWLETT), A., ii, 567.
- myocyanus*, physiology of (LOEW and KOZAI), A., ii, 675.
- gases produced by (PAKES and JOLLYMAN), T., 325; P., 1900, 189.
- tartricus*, production of acetylmethyl-carbinol by (GRIMBERT), A., ii, 323.
- tubercle, biochemical studies on the (LEVENE), A., ii, 675.
- typhosus*, action of, on carbohydrates (HARDEN), T., 610; P., 1901, 57.
- Bacteria**, chemistry of (BENDIX), A., ii, 266.
- reaction of, to chemical stimuli (JENNINGS and CROSBY), A., ii, 615.
- a possible cause of clumping in (BRUNTON), A., ii, 69.
- action of, on carbohydrates (HARDEN), T., 610; P., 1901, 57.
- decomposition of formic acid by (PAKES and JOLLYMAN), T., 386; P., 1901, 29.
- action of, on formates in presence of nitrates (PAKES and JOLLYMAN), T., 459; P., 1901, 39.
- reduction of sulphates by (BEYERINCK), A., ii, 120; (SALTET and STOCKVIS), A., ii, 265.
- gases produced by, from certain media (PAKES and JOLLYMAN), T., 322; P., 1900, 189.
- formation of solanine in potatoes by (WEIL), A., ii, 266.
- glucoproteins as a culture media for (LEPIERRE), A., i, 622.
- albumin-forming, in soil and stable manure (GERLACH and VOGEL), A., ii, 675.
- which decompose carbamide, experiments with (BEYERINCK), A., ii, 264.
- denitrifying. See Agricultural Chemistry.
- peptonising, of milk, biology of (KALISCHER), A., ii, 119.
- vinegar, biological differentiation of the two principal (BERTEAND and SAZERAC), A., ii, 523.
- Bacterium icteroides*, action of, on dextrose (HARDEN), A., ii, 567.
- "*Bacterium radicola*," morphology of (STUTZER), A., ii, 265.
- Badenite** from Roumania (PONI), A., ii, 26.
- Balance Sheet** of the Chemical Society, March, 1901, and of the Research Fund, March, 1901. See Annual General Meeting, T., 885.
- Balsam** of *Picea vulgaris* (TSCHIRCH and BRÜNING), A., i, 91.
- of *Pinus Pinaster* (TSCHIRCH and BRÜNING), A., i, 220.
- of *Pinus sylvestris* (TSCHIRCH and NIEDERSTADT), A., i, 397.
- Barbituric acid** (*malonylcarbamide*), electrolytic reduction of (TAFEL and WEINSCHENK), A., i, 72.
- condensation of, with aldehydes (CONRAD and REINBACH), A., i, 410; (WEINSCHENK), A., i, 528.
- Barium**, occurrence of, in the spring water of Boston Spa (RICHARDS), A., ii, 252.
- and alkali sulphates, simultaneous presence of, in mineral waters (CARLES), A., ii, 506.
- Barium compounds**, recognition of, as the cause of poisoning (VITALI), A., ii, 39.
- Barium bromide** and chloride, combination of, with ammonia in aqueous solution (DAWSON and McCRAE), T., 1070; P., 1901, 177.
- borate (OUVRARD), A., ii, 158.
- chloride and nitrate, transport numbers for (NOYES), A., ii, 144.
- hydride (GUNTZ), A., ii, 385.
- manganate and manganite, preparation of (KASSNER and KELLER), A., ii, 657.
- nitrite (ARNDT), A., ii, 507.
- sulphate, solubility of, in solutions of sodium thiosulphate (DOBBIN), A., ii, 348.
- nitrosulphate (DIVERS and HAGA), T., 1099; P., 1901, 164.
- sulphide, preparation and crystalline form of (MÜLLER), A., ii, 60.
- ammonium imidosulphite (DIVERS and OGAWA), T., 1102; P., 1901, 164.
- Barium organic compounds** :—
- ferriyanides (FISCHER and MÜLLER), A., i, 455.
- and barium potassium platoso-oxalonitrites (VÉZES), A., i, 187.
- Barium**, estimation of, as the oxalate (PETERS), A., ii, 692.
- Barley**. See Agricultural Chemistry.
- Barometer** with automatic zero adjustment, a new laboratory (WÖRINGER), A., ii, 648.
- Barosma betulina* and *B. serratifolia*, oil of (KONDAKOFF and BACHTSCHÉEFF), A., i, 334.
- Base**, m. p. 88°, from the reduction of terpinene nitrosite (SEMMLER), A., i, 331.

Base, tertiary, from the action of ammonia on di-iodoethyl ether (SAND), A., i, 741.

$C_8H_7O_2N_3$, from tetrahydrouic acid, and its salts (TAFEL), A., i, 237.

$C_8H_{19}ON$, from the reduction of 3-keto-2:2:5:5-tetramethylpyrrolidine (PAULY and BOEHM), A., i, 607.

$C_9H_{17}N$, and its isomeride, from the reduction of fenchocamphoroxime (WALLACH and NEUMANN), A., i, 333.

$C_{10}H_{11}O_2N$, from the oxime of acetylpropylidenebistetric acid (WOLFF and GÄBLER), A., i, 285.

$C_{10}H_{16}ON_2$, from α -camphornitrilamide and alkalis (TIEMANN and TIGGES), A., i, 20.

$C_{10}H_{17}ON$, from the reduction of terpineneoxideoxime (SEMMLER), A., i, 331.

$C_{10}H_{19}N$, from the reduction of terpinene nitrosite (WALLACH and LAUFFER), A., i, 90.

$C_{11}H_{14}ON_2$, from cytosine and hydriodic acid in presence of amorphous phosphorus (FREUND and FRIEDMANN), A., i, 289.

$C_{15}H_{18}O_3N_2$, from ammonia, hydrochloric acid and acetylharinaline (FISCHER), A., i, 406.

$C_{15}H_{21}ON_2$, from the reduction of 5- β -hydroxy- β -o-nitrophenylethyl-2-ethylpyridine (CASTNER), A., i, 563.

$C_{17}H_{23}N$, $C_{17}H_{24}NCl$, from $C_{17}H_{25}ON$ (FARBWERKE VORM. MEISTER, LUCIUS, & BRÜNING), A., i, 691.

$C_{17}H_{25}ON$, from the reduction of anilinomethylenecamphor (FARBWERKE VORM. MEISTER, LUCIUS, & BRÜNING), A., i, 691, 692.

$C_{17}H_{27}N_3$, from the oxidation of β -camphornitrilamide (TIEMANN and TIGGES), A., i, 20.

$C_{19}H_{22}ON_2$, and its hydrochloride, from the action of alcoholic potash on hydrochlorocinchonine (LANGER), A., i, 404.

$C_{19}H_{22}ON_2$, and its oxalate, and phenylhydrazone from *allocinchonine* sulphate (HLAVNÍČKA), A., i, 405.

$C_{20}H_{24}O_2N_4$, and its derivatives, from mercury fulminate and dimethylaniline (SCHOLL and BERTSCH), A., i, 523.

$C_{21}H_{20}ON_2$, from the action of alcoholic sulphuric acid and ammonia on *p*-toluidino-*p*-toluquinoneditolylimide (BÖRNSTEIN), A., i, 376.

$C_{22}H_{29}N$, from Russian petroleum (CHLOPIN), A., i, 43.

Base, $C_{24}H_{20}O_2N_2$, and $C_{24}H_{22}O_2N_2$, and their hydrochlorides, from trihydroxyiminotriphenacylamine (KORTEN and SCHOLL), A., i, 550.

$C_{28}H_{28}N_4$ (or $C_{14}H_{14}N_2$), and $C_{32}H_{30}N_4$ (or $C_{16}H_{18}N_4$), and their derivatives, from aniline and *o*-toluidine and methylenechlorohydrin (GRASSI-CRISTALDI and SCHIAVO-LENTI), A., i, 55.

$C_{30}H_{24}O_2N_4$, from the action of alcoholic sodium hydroxide on 3-acetylaminophenylrosinduline chloride (KEHRMANN and SILBERSTEIN), A., i, 102.

$C_{35}H_{35}N_5$, and its hydrochloride, from amino-*p*-toluquinoneditolylimide, *p*-toluidine and its hydrochloride, and alcohol (BÖRNSTEIN), A., i, 376.

Bases, action of, on salts of the amines (COLSON), A., ii, 496.

from the compounds formed by the action of α -chlorohydrin on tertiary amines (BIENENTHAL), A., i, 128.

from the condensation of formaldehyde with amines (GOLDSCHMIDT), A., i, 652.

aromatic, action of alcoholic silver nitrate on (VAUBEL), A., i, 691.

organic, of Russian petroleum (CHLOPIN), A., i, 42.

aryltiosulphonates of (TRÖGER and LINDE), A., i, 337.

in Scottish shale oil (GARRETT and SMYTHE), P., 1900, 190.

tertiary, action of hydrogen peroxide on (AUERBACH and WOLFFENSTEIN), A., i, 613.

Bassoric acid and **Bassorin** (O'SULLIVAN), T., 1177; P., 1901, 156.

Bats, hibernation in (RULOT), A., ii, 256.

Bauxites, Italian, composition of supposed (FORMENTI), A., ii, 557.

Bavenite from Baveno granite (ARTINI), A., ii, 664.

Bay, oil of (SCHIMMEL & Co.), A., i, 394.

Beans. See Agricultural Chemistry.

Bear, polar, bile of the (HAMMARSTEN), A., ii, 520.

Bearswort oil, *isoirone* from (HAARMANN & REIMER), A., i, 727.

Beech seedlings, glucoside in (TAILLEUR), A., ii, 466.

Beer, test for arsenic in (CHAPMAN; ALLEN; REPORT OF THE COMMISSION TO THE MANCHESTER BREWERS' CENTRAL ASSOCIATION), A., ii, 125; (THOMSON and SHENTON), A., ii, 345.

- Beer**, detection of "saccharin" in, free from salicylic acid (WIRTHLE), A., ii, 135.
 detection of salicylic acid in (PEREIRA), A., ii, 428.
 refractometric method of estimating alcohol and solid matter in (LING and POPE), A., ii, 628.
 estimation of arsenic in (JONES; RYDER and GREENWOOD), A., ii, 280.
- Beeswax**. See Wax.
- Beet-molasses**, lactic acid in (SCHÖNE and TOLLENS), A., i, 116.
 new indicator for estimating the acidity of (RUNYAN), A., ii, 629.
- Beetroot**, colouring matter of, and its absorption spectrum (FORMÁNEK), A., ii, 35.
 Scheibler's extraction method for the determination of the polarisation of (HERZFELD), A., ii, 426.
 rapid estimation of sugar in (HILTNER and THATCHER), A., ii, 535.
 See also Agricultural Chemistry.
- Beetroot-red**, detection of, in wine (BELLIER), A., ii, 210.
- Benz-**. See also Benzo- and Benzoyl-, under the Parent Substance.
- Benzal-**. See Benzylidene-.
- Benzaldazine**, *o*-chloro-, and its reduction (CURTIUS and PAULI), A., i, 429.
- Benzaldazines**, reduction of (CURTIUS and FRANZEN), A., i, 293.
- Benzaldehyde**, condensation of, with glyoxal and ammonia (WEWIÓRSKI), A., i, 353.
 action of hydrazobenzene on (RASSOW and LUMMERZHEIM), A., i, 777.
 action of, on hydroxy-acids and sugars (ALBERDA VAN EKENSTEIN), A., i, 120.
 action of, on methyl nonyl ketone (CARETTE), A., i, 13, 127.
 condensation of, with phenyl ethyl ketone (ABELL), T., 928; P., 1901, 128.
 condensation of, with propaldehyde (HACKHOFFEL), A., i, 277.
 condensation of, with pyruvic acid (ERLENMEYER), A., i, 390.
 action of, on sodiummenthol (MARTINE), A., i, 599.
 compound of, with propylidenehydrazone cyanohydrin (EIDNER and SENF), A., i, 166.
 quinol- and resorcinol-carbohydrazones (EINHORN and ESCALES), A., i, 653.
- Benzaldehyde**, *o*-amino-, and its *p*-nitrophenylhydrazone and *di*bromo- (BAMBERGER and DEMUTH), A., i, 392.
- Benzaldehyde**, *o*-nitro-, action of light on (CIAMICIAN and SILBER), A., i, 390, 547.
- Benzaldehyde-*p*-bromo- and -*p*-chloro-anilines** (HANTZSCH and SCHWAB), A., i, 379.
- Benzaldehydecyanohydrin**, condensation of, with urethane (LEHMANN), A., i, 275.
- Benzaldehydenitrotolylhydrazone** (POPE and HIRD), T., 1143; P., 1901, 186.
- Benzaldehyde- β -*o*-, -*m*-, and -*p*-phenylbenziminooazolehydrazone** (MIKLASZEVSKI and V. NIEMENTOWSKI), A., i, 762.
- Benzaldehydophenylhydrazone** (BAMBERGER and GROB), A., i, 567.
 oxidation of (BAMBERGER and GROB), A., i, 296.
- Benzaldehyde-*o*-sulphonic acid** (LEVINSTEIN, LTD.), A., i, 725.
- iso***Benzaldoxime** mesityl ether and *m*- and *p*-nitro- (BAMBERGER and RISING), A., i, 141.
- Benzaldoximes**, *o*-amino-, reactions of, and its dibromo-derivative (BAMBERGER and DEMUTH), A., i, 391.
 α - and β -*p*-nitro-, and their hydrochlorides (EKECRANTZ), A., i, 277.
- Benzalsultim**, chloro- ("chloro- ψ -saccharin") (MASELLI), A., i, 271.
- Benzamide**, sodium, action of alkyl iodides, acid chlorides, halogen derivatives of esters and bromoamides on (TITHERLEY), T., 393; P., 1901, 29.
- Benzamides**, alkyl substituted, and their hydrochlorides, and sodium derivatives, preparation of (TITHERLEY), T., 403; P., 1901, 30.
 substituted, hydrolysis of (REID), A., i, 29.
- Benzamidine**, action of, on aldehydes and on ketones (KUNCKELL and BAUER), A., i, 758, 759.
p-nitro-, cyanidines and pyrimidines from (RAPPEPORT), A., i, 567.
- Benzamidine-*iso*butyrophenone** and its phenylhydrazone (KUNCKELL), A., i, 294.
- Benzanilide**, alkylation of (LANDER), T., 698; P., 1901, 59.
- Benzaurin**, diacetyl derivative (HERZIG and WENGRAF), A., i, 703.
- Benzene**, formula of (RICHARDSON), A., i, 196; (PELLINI), A., ii, 366.
 molecular configuration of (ERLENMEYER), A., i, 373.
 dielectric constant of (TURNER), A., ii, 54.
 bromination and iodination of (EDINGER and GOLDBERG), A., i, 22, 23.

- Benzene**, chlorination of, in presence of the mercury aluminium couple (COHEN and DAKIN), T., 1118; P., 1901, 91.
- action of isobutylene dibromide on, in presence of aluminium chloride (BODROUX), A., i, 523.
- action of trimethylene dibromide on, in presence of aluminium chloride (BODROUX), A., i, 196.
- iodosulphuride (WEINLAND and STILLE), A., i, 684.
- disubstitution derivatives of, nitration of (CLOEZ), A., i, 72.
- estimation of sulphur in commercial, intended for enriching illuminating gas (IRWIN), A., ii, 473.
- Benzene**, bromo-, action of concentrated nitric acid on (BANDROWSKI), A., i, 21.
- bromonitro-, isomeric, simultaneous formation of (HOLLEMAN), A., i, 318.
- o*- and *p*-bromonitro-, action of, on *p*-phenylenediamine (BANDROWSKI), A., i, 48.
- m*-dibromodinitro-, derivatives of (JACKSON and COHSE), A., i, 585.
- tribromodinitro- and tribromotrinitro-, action of sodium sulphite on (JACKSON and EARLE), A., i, 585.
- chlorodibromo- and dichlorobromoderivatives of (HURTLEY), T., 1293; P., 1901, 191.
- 1-chloro-2:4-dinitro-, action of alcoholic potassium cyanide on (VAN HEEREN), A., i, 460.
- 1-chloro-3:5-dinitro-, action of alcoholic sodium methoxide on (DE KOCK), A., i, 460.
- s*-triiodo- (JACKSON and BEHR), A., i, 586.
- nitro-, electrolytic reduction of (BOEHRINGER & SONS), A., i, 684.
- interaction of, with aniline in presence of alkalis (WOHL and AUE), A., i, 612.
- o*-, *m*- and *p*-dinitro-, action of sodium monosulphide on (DE BRUYN and BLANKSMA), A., i, 460.
- trinitro-, additive compounds of, with α - and β -naphthylamine, and their acetyl derivatives (SUDBOROUGH), T., 525; P., 1901, 44.
- 1:2:3:5-tetranitro-, 1:3-dinitro-4:5-dinitroso-, and 1:3:5-trinitro-2-nitroso- (NIETZKI and DIETSCHY), A., i, 196.
- nitroso-, action of, on aromatic hydrazines (SPITZER), A., i, 98; (BAMBERGER), A., i, 171.
- action of, on toluene-*p*-sulphinic acid (BAMBERGER and RISING), A., i, 201.
- Benzeneazooacetonedicarboxylic acid**, *p*-nitro-, and its sodium salts, ethyl ester, phenylhydrazone, and oxime (BÜLOW and HÖPFNER), A., i, 240.
- Benzeneazoaminomethylaziminotoluene hydrochloride** (PINNOW), A., i, 485.
- Benzeneazo-*o*-bromo-*p*-cresol**, and its acetyl and benzoyl derivatives (HEWITT and PHILLIPS), T., 160; P., 1900, 223.
- Benzeneazo-*p*-cresol** (DIMROTH), A., i, 440.
- and *o*-, *m*- and *p*-bromo-, and their acetyl and benzoyl derivatives (HEWITT and PHILLIPS), T., 160; P., 1900, 223.
- 4-Benzeneazo-1:3(or 5)-diphenyl-5(or 3)-benzylpyrazole** (BÜLOW and GROTOWSKY), A., i, 476.
- Benzeneazohydroxy-methylphenyl- and -phenyl-mercuric salts** (DIMROTH), A., i, 440.
- Benzeneazohydroxytolualdehydes** and their derivatives (BORSCHKE and BOLSER), A., i, 573.
- Benzeneazohydroxyxylylides** (BAMBERGER and RISING), A., i, 531.
- Benzeneazo- α -ketoglutarimide** and its phenylhydrazone (BÜLOW and HÖPFNER), A., i, 241.
- Benzeneazo- β -naphthol** and its isomeride, and their nitro- and bromo-derivatives (BETTI and LEONCINI), A., i, 55.
- Benzeneazo- α - and - β -naphthylleucauramines** (MÖHLAU and HEINZE), A., i, 433.
- Benzeneazo-*o*-nitrophenyl ethyl ether** (HEWITT and LINDFIELD), T., 159; P., 1900, 222.
- Benzeneazo-*o*-nitrosalicylic acid**, and its methyl and ethyl esters (HEWITT and FOX), T., 50; P., 1900, 189.
- Benzeneazophenylacetylacetophenone** (BÜLOW and GROTOWSKY), A., i, 475.
- Benzeneazophenyliminomethanethio-methane** (BUSCH and HOLZMANN), A., i, 235.
- Benzeneazophenylleucauramine** (MÖHLAU and HEINZE), A., i, 432.
- Benzeneazopyrrole** and its 2:4- and 2:5-dimethyl and 5:2-phenylmethyl derivatives (PLANCHER and SONCINI), A., i, 432.
- Benzene-4-azoresorcinol** and its phenylhydrazone and methyl ether (ORNDORFF and THEBAUD), A., i, 774.
- Benzeneazoresorcyraldehyde** and its phenylhydrazone (BORSCHKE and BOLSER), A., i, 573.
- Benzeneazosalicylic acid**, nitration of, and the ethyl ester of the *p*-nitro-derivative (HEWITT and FOX), T., 49; P., 1900, 189.

- Benzenediazohydroxylamino-*p*-toluene** (BAMBERGER), A., i, 171.
- Benzenediazonium.** See Diazonium.
- Benzenepentacarboxylic acid** (VERNÉUIL), A., i, 546.
- Benzenesulphonic acid and *p*-bromo-, and *p*-chloro-, purification of** (KRAFFT and WILKE), A., i, 74.
- m*-mono- and *di*-bromo- (DIMROTH), A., i, 440.
- 4-bromo-2-nitro-, 4-chloro-2-nitro-, and their chlorides, and *p*-nitro- and its chloride and amide (BLANKSMA), A., i, 461.
- Benzene-4-sulphonic acid, 1:3-dichloro-6-nitro-** (BADISCHE ANILIN- and SODA-FABRIK), A., i, 755.
- Benzenesulphonic acids, amino-, alkylated** (GNEHM and SCHEUTZ), A., i, 519.
- 7-Benzenesulphonoxycoumarone-4-carboxylic acid, methyl ester** (v. PECHMANN and GRAEGER), A., i, 287.
- Benzenethiolsulphonic acid, diazoaryl esters** (TRÖGER and EWERS), A., i, 172.
- Benzene-1:3:5-tricarboxylic acid.** See Trimesic acid.
- Benzenoid amines and their acetyl and formyl derivatives, relation between physical constants and constitution in** (GORDAN and LIMPACH), T., 1080; P., 1901, 154.
- isomeric change and meta-substitution in (LAPWORTH), P., 1901, 2.
- primary, interaction of, with urethanes (DIXON), T., 102; P., 1900, 207.
- Benzhydrol, 4-nitro-4'-amino-** (KALLE & Co.), A., i, 698.
- Benzhydrol ether** (STOBBE and ZEITSCHSEL), A., i, 538.
- Benzhydrols, condensation of, with *p*-hydroxyazo-compounds** (MÖHLAU and KEGEL), A., i, 56.
- Benzhydroxamic acid, *m*-nitro- and *m*-nitroso-** (ANGELICO and FANARA), A., i, 707.
- Benzhydrylamine and its salts** (KONOWALOFF), A., i, 282.
- Benzidine, electrolytic preparation of** (LÖB), A., i, 487.
- 3:3'-dichloro-, and its salts and dibenzoyl derivative (COHN), A., i, 166.
- Benzil, condensation of, with dibenzyl ketone** (HENDERSON and CORSTORPHINE), T., 1256; P., 1901, 190.
- Benzilic acid (hydroxydiphenylacetic acid, diphenylglycollic acid), condensation of, with phenols** (BISTRZYCKI and NOWAKOWSKI), A., i, 716.
- bimolecular anhydride of (EINHORN and PREIFFER), A., i, 712.
- Benzilmonooximes, action of nitrogen tetroxide on** (PONZIO), A., i, 154.
- Benziminazoles, chloro-** (MANUELLI and RECCI), A., i, 49.
- Benzoic acid, detection of cinnamic acid in** (JORISSEN), A., ii, 207, 291.
- Benzoic acid, mercuric salt** (DIMROTH), A., i, 440.
- Benzoic acid, benzoyl-*o*- and -*m*-tolyl esters** (BARTOLOTTI), A., i, 36.
- chloromethyl ester (HENRY), A., i, 581.
- 2:4-*di*- and 2:4:6-*tri*-iodophenol esters (BRENANS), A., i, 643.
- Benzoic acid, *o*-amino-**. See Anthranilic acid.
- 2:3-diamino-, and its compounds with sugars (SCHILLING), A., i, 385.
- o*- and *p*-bromo-, thermochemistry of (MASSOL), A., i, 323.
- 2:3-bromonitro- and 2:3-chloronitro- (HOLLEMAN), A., i, 275.
- o*-chloro-, thermochemistry of (MASSOL), A., ii, 226.
- o*- and *m*-chloro- and -bromo-, nitration of (HOLLEMAN and DE BRUYN), A., i, 591.
- 2:3:5-trichloro-, and its amide, chloride, nitrile, salts, ethyl ester and *mono*- and *di*-nitro-derivatives (MATTHEWS), T., 43; P., 1900, 187.
- o*-chlorodinitro-, structure of Kalle & Co.'s (HOLLEMAN), A., i, 591.
- 2-chloro-3:5-dinitro-, and its ethyl ester (COHN), A., i, 642.
- p*-cyano-, methyl ester (RUPE and v. MAJEWSKI), A., i, 104.
- o*-iodo-, thermochemistry of (MASSOL), A., ii, 226.
- nitro-, reduction of, by hyposulphurous acid (GOLDBERGER), A., i, 23.
- p*-nitro-, *o*-nitrophenyl ester (KYM), A., i, 47.
- tri*nitro-, ethyl ester, additive compounds of, with α - and β -naphthylamine (SUDBOROUGH), T., 531; P., 1901, 44.
- o*-nitroso-, and its esters (CIAMICIAN and SILBER), A., i, 390, 548.
- thio-, action of alkyl thiocyanates and alkylthiocarbimides on (WHEELER and MERIAM), A., i, 515.
- additive reactions of (WHEELER), A., i, 636.
- Benzoic acids, monosubstituted, acidimetric value of** (MASSOL), A., i, 323.
- Benzoic anhydride, *m*-bromo- and *m*-nitro-** (AUTENRIETH), A., i, 186.
- Benzoic chloride, *o*-nitro-, crystallised** (MAVROJANNIS), A., i, 470.

- Benzoic thiocyanate**, action of, on ethyl phenyl-thiol- and -thion-carbazinate (WHEELER and DUSTIN), A., i, 25.
- o*-Benzoicsulphinide**. See "Saccharin."
- Benzo- β -ketopentamethyleneazinecarboxylic acid** and its ethyl ester, and their sodium salts and benzylidene derivatives (THOMAS-MAMERT and STRIEBEL), A., i, 614.
- Benzonitrile** *hexachloride*, interaction of, with alcoholic soda and with quinoline (MATTHEWS), T., 44; P., 1900, 187.
- Benzophenone**, action of ethyl alcohol and of alcoholic hydrogen chloride on (MACKENZIE), T., 1210; P., 1901, 150.
derivatives (BARLOTTI), A., i, 36.
chloride, action of sodium alkyl oxides on (MACKENZIE), T., 1206; P., 1901, 150.
- Benzophenones**, amino-, substituted, action of aromatic amines on, in presence of sulphuric acid (LEMOULT), A., i, 425.
- Benzophenonedisulphone**. See Diethyl-disulphonatediphenylmethane.
- Benzophenonephosphinic acid** and its derivatives (MICHAELIS and GÜSEWELL), A., i, 300.
- Benzophenone-*o*-sulphonic acid**. See Benzoylbenzene-*o*-sulphonic acid.
- Benzopinacene** from alcohol and benzophenone (CIAMICIAN and SILBER), A., i, 36.
- 1:4-Benzopyranol**, derivatives (BÜLOW and WAGNER), A., i, 400, 559.
and its mono- and di-acetyl and dibenzoyl derivatives, and dimethyl ether (BÜLOW and v. SICHERER), A., i, 603.
- Benzo- γ -pyronecarboxylic acid** and its ethyl ester and the action of ammonia on (RUHEMANN and BAUSOR), T., 471; P., 1901, 40.
- o*-Benzoquinone**. See *o*-Quinone.
- Benzoquinonephenylhydrazonetetramethyl δ aminodiphenylmethane** (MÜHLAU and KEGEL), A., i, 57.
- 1-Benzoxo-2-benzoylcamphene** and the action of aniline, phenylhydrazine, sulphuric acid and of alcoholic potash on (FORSTER), T., 991; P., 1901, 167.
- Benzoxymethylfurfural** (FENTON and GOSTLING), T., 811; P., 1901, 119.
- p*-Benzoxyphenylacetamide** (ORTON), T., 1354; P., 1901, 200.
- Benzoyl-**. See also under Parent Substance.
- Benzoylacetetic acid**, esters, action of epichlorohydrin and epibromohydrin on the sodium derivatives of (HALLER), A., i, 538.
- Benzoylacetetic acid**, esters, action of ethyl iodide and dry silver oxide on (LANDER), P., 1901, 59.
- 4-Benzoylacetylpyridine** and its salts and isooxazole derivative (TSCHERNE), A., i, 749.
- o*-Benzoylaminobenzoic acid**, methyl ester (MEINER), A., i, 471.
methyl and ethyl esters (MEINER), A., i, 645.
- p*-Benzoylaminophenylacetic acid** and its amide (ORTON), T., 1353; P., 1901, 200.
- α -Benzoylamino- β -isopropylacrylic acid** and anhydride (ERLENMEYER and KUNLIN), A., i, 468.
- Benzoylanisoylbromomethane** (POND and SHOFFSTALL), A., i, 36.
- Benzoylanisoylmethane**. See α -Hydroxy-anisylideneacetophenone.
- Benzoylation** of fatty acids in presence of ammonia (ORTON), T., 1351; P., 1901, 200.
- Benzoylbenzene-*o*-sulphonic acid** (*benzophenonesulphonic acid*) and its salts (KRANNICH), A., i, 153.
- o*-Benzoylbenzoic acid**, tautomerism of (HALLER and GUYOT), A., i, 146.
trichloro- (GRAEBE and ROSTOWZEW), A., i, 544.
- Benzoylbenzylamine**, nitroso-, action of, on aniline, phenylhydrazine, and *p*-toluidine (APITZSCH), A., i, 138.
- δ -Benzoyl- $\alpha\beta$ -butanediol** (HALLER), A., i, 539.
- α -Benzoylcamphor** and its isomeride (FORSTER), T., 987; P., 1901, 167.
- Benzoylcarbamide-*o*-sulphonic acid**, and *p*-nitro-, and their salts (HOLMES), A., i, 271.
- Benzoylchloroaminobenzene**, preparation of (CHATTAWAY and ORTON), T., 279; P., 1900, 231.
- Benzoyl-*o*- and -*m*-cresol** (BARLOTTI), A., i, 36.
- Benzoylcyanidephenylhydrazone** (SACHS and BEY), A., i, 229.
- Benzoylcyanooacetic acids**, *o*-, *m*-, and *p*-nitro-, esters (MAVROJANNIS), A., i, 470.
- Benzoyldiacetylene** (MARCH), A., i, 596.
- Benzoyldiphenylcarbamide** (SCHALL), A., i, 766.
- Benzoylethylideneaniline**, and its dibromide and nitrosoamine (EIBNER), A., i, 640.
- Benzoyl- ψ -ethylphenylthiocarbamide** (WHEELER and MERRIAM), A., i, 515.

- Benzoylformaldehyde-*o*-, -*m*-, and -*p*-nitrophenylhydrazones** and the isomerides of the *o*- and *m*-compounds (BAMBERGER and SCHMIDT), A., i, 566.
- Benzoylformaldehydphenylhydrazone** and its isomeride (BAMBERGER and SCHMIDT), A., i, 565.
- Benzoylformic acid, *o*-amino-, ethyl ester** (ERDMANN), A., i, 536.
See also *o*-Formylaminobenzoic acid, ethyl ester.
methyl ester (MEHNER), A., i, 645.
- β -Benzoylglutaric acid** and its salts and ketodilactone (FITTIG and SALOMON), A., i, 122.
- α -Benzoylheptinene** (*benzoylænanthylidene*) and the action of sulphuric acid on (MOUREU and DELANGE), A., i, 14.
decomposition of, by alkalis (MOUREU and DELANGE), A., i, 14.
- Benzoylhexoxymethane** (MOUREU and DELANGE), A., i, 14.
- Benzoylimino-dithiocarbonic acid, esters** (WHEELER and MERRIAM), A., i, 705.
- Benzoylindeneoxalic acid, and *p*-nitro-, ethyl esters** (THIELE), A., i, 76.
- Benzoylmandel-amide and -methyamide** (ORTON), T., 1354; P., 1901, 200.
- Benzoylmethylisocarbamide** (MCKEE), A., i, 757.
- Benzoyl 4-methylsemithiocarbazide** (YOUNG and OATES), T., 667; P., 1901, 86.
- Benzoyl- ψ -methyl-thiocarbamide and -phenylthiocarbamide** (WHEELER and MERRIAM), A., i, 515.
- α -Benzoyl- α -naphthylhydrazine** and its β -acetyl derivative (McPHERSON and GORE), A., i, 572.
- Benzoyl-*o*-nitroanilide, *p*-nitro-** (KYM), A., i, 47; (MIKLAŹEWSKI and v. NIEMENTOWSKI), A., i, 761.
- Benzoyl-*m*-nitroanilideiminochloride** (LEY), A., i, 760.
- Benzoylænanthylidene:** See Benzoylheptinene.
- γ -Benzoyl- β -phenylbutyric acid** and its semicarbazone (STOBBE), A., i, 324.
- Benzoylphenylcarbamides, *s*- and *as*-** (MCKEE), A., i, 756.
- Benzoylphenylhydrazine, *m*-bromo- and *m*-nitro-** (AUTENRIETH), A., i, 186.
- Benzoylphenylnitrosohydrazine** (VOSWINCKEL), A., i, 618.
- 2-Benzoyl-3-phenylcyclopentanone-4-carboxylic acid, methyl ester, and its semicarbazone** (STOBBE and FISCHER), A., i, 148.
- 1-Benzoylpyridazone, 4:5-dibromo-** (BIS-TRZYCKI and HERBST), A., i, 386.
- Benzoyldithiocarbamic acid, esters** (WHEELER and MERRIAM), A., i, 514; (WHEELER and JOHNSON), A., i, 705.
- Benzoylthioglycollamide** (WHEELER and MERRIAM), A., i, 515.
- Benzoylthiolcarbanilic acid** (WHEELER), A., i, 636.
methyl ester (WHEELER and DUSTIN), A., i, 25.
- Benzoyl-*o*-toluidide, 6-chloro-** (COHN), A., i, 637.
- Benzoyltoluidides, *o*-, *m*-, and *p*-, *o*-amino-** (MEHNER), A., i, 472.
- Benzoyl-*m*-tolyl methyl ether** (BARTOLOTTI), A., i, 37.
- α -Benzoyl- γ -valerolactone, δ -chloro- and δ -bromo-, and the phenylhydrazone of the chloro-compound** (HALLER), A., i, 539.
- o*-Benzoyl-*m*-xylylide, *o*-amino-** (MEHNER), A., i, 472.
- Benzyl alcohol** from ylang-ylang oil (v. SODEN and ROJAHN), A., i, 733.
influence of, on the potential of oxidation cells (SCHAUM), A., ii, 300.
- Benzyl chloride and iodide, action of, on pyridine** (TSCHITSCHIBABIN), A., i, 484.
cyanide. See Phenylacetoneitrile.
nitrite (v. BAEYER and VILLIGER), A., i, 309.
m-xylyl sulphide (WHEELER and JOHNSON), A., i, 707.
- d*- α -Benzylallylmalamide** (LUTZ), A., i, 10.
- Benzylamine, action of, on β -chloroallylthiocarbimide** (DIXON), T., 559; P., 1901, 49.
oxidation of (BAMBERGER and SCHEUTZ), A., i, 587.
- Benzylaniline, action of, on β -chloroallylthiocarbimide** (DIXON), T., 558; P., 1901, 49.
m-amino-, and *m*-nitro-, and their hydrochlorides (PURGOTTI and MONTI), A., i, 22.
- Benzylantipyrine** and its hydrochloride, and amino- and nitro-derivatives (MICHAELIS, VOSS, and GREISS), A., i, 409.
- Benzylazoimide** (CURTIUS and DARAPSKY), A., i, 573.
- Benzylbromocamphor** and its isomeride (HALLER and MINGUIN), A., i, 599.
- β -Benzylbutyric acid, dithio-, ethyl ester and its α -mono- and -di-methyl and -ethyl derivatives** (POSNER), A., i, 704.
- Benzylcarbinol** (*phenylethyl alcohol*) in oil of roses (v. SODEN and ROJAHN), A., i, 39, 733.
- Benzylcarvacrol** and its acetyl derivative (VENTURI), A., i, 590.

- α -Benzylcinnamic acid** (*benzylidene-hydrocinnamic acid*), condensation of, to α -benzylidenehydrindone (SCHMID), A., i, 210.
- Benzyl-*m*-cresol** and its acetyl derivative (VENTURI), A., i, 590.
- β -Benzylisocrotonic acid**, thio- (POSNER and DEINHARDT), A., i, 704.
- Benzylidihydroisindole**, *o*-amino- and *o*- and *p*-nitro- (FRÄNKEL), A., i, 45.
- Benzylidimethylcarbinol** (GRIGNARD), A., i, 680.
- Benzylethylaminoanthraquinone** (HALLER and GUYOT), A., i, 279.
- Benzylethylaminobenzenesulphonic acid**, salts (GNEHM and SCHEUTZ), A., i, 520.
- Benzylethylamino-benzyl- and -benzoyl-benzoic acids** (HALLER and GUYOT), A., i, 276.
- m*-Benzylethylaminophenol** and its phthalein (GNEHM and SCHEUTZ), A., i, 520.
- Benzylethylaniline**, nitration of (GNEHM and SCHEUTZ), A., i, 520.
- Benzyl- β -glutaric acid** and its salts and ketodilactones (FITTIG and STERNBERG), A., i, 121.
- Benzylhydrazine**, chloro- and nitroso-derivatives (CURTIUS and PAULI), A., i, 429.
- Benzylhydrindamine** and its isomeric bromocamphorsulphonates and picrate (KIPPING and HALL), T., 434; P., 1901, 37.
- β -Benzylhydroxylamine**, action of air and water on (BAMBERGER and SZOLAYSKI), A., i, 84.
- Benzylidene chloride**, action of sodium alkyl oxides and of phenol on (MACKENZIE), T., 1212; P., 1901, 150.
- Benzylideneacetoacetic- β -aminocrotonic acid**. See δ -Phenyl- β -amino- β -heptene- ζ -one- γ -dicarboxylic acid.
- Benzylideneacetone**, sulphonal derivatives of (POSNER), A., i, 474.
- Benzylideneacetophenone**, sulphonal derivatives of (POSNER), A., i, 474.
- Benzylidene- β -acetylglutaric acid** and its salts, and ketodilactone and its dibromide (FITTIG and STERNBERG), A., i, 121.
- Benzylideneaminophenanthrene** (SCHMIDT and STROBEL), A., i, 464.
- Benzylideneaminophenylguanidine**, *m*-nitro-, nitrate and picrate (PELLIZARI and RICKARDS), A., i, 769.
- Benzylideneaniline- β -naphthol** (BETTI), A., i, 754.
- Benzylideneaniline** and its chloro-, bromo-, and nitro-derivatives (HANTZSCH and SCHWAB), A., i, 379.
- Benzylideneaniline picrate** (BETTI and SPERONI), A., i, 81.
- hydrogen sulphite**, *m*-nitro- (EIBNER), A., i, 378.
- Benzylideneaniline-4-methyl-2-cyclopentanonecarboxylic acid**, ethyl ester (DIECKMANN), A., i, 542.
- Benzylideneanil- α - and - β -naphthols**, and *m*-nitro-derivative of the β -compound (BETTI and SPERONI), A., i, 81.
- Benzylidene-*p*-anisidine** (HANTZSCH and SCHWAB), A., i, 379.
- Benzylidenebarbituric acid**, and *o*-nitro- and its compound with ammonia (CONRAD and REINBACH), A., i, 410.
- Benzylidenebenzamidine** and its hydrochloride (KUNCKELL and BAUER), A., i, 759.
- Benzylidenebenzylamine- β -naphthol** and its diacetyl derivative (BETTI), A., i, 754.
- Benzylidenebenzylhydrazine**, chloro- and nitroso-derivatives (CURTIUS and PAULI), A., i, 429.
- Benzylidenebisacetoacetic acid**, ethyl ester, tautomerism of (RABE), A., i, 34.
- Benzylidenebisaminothiazole** and its decomposition (HANTZSCH and SCHWAB), A., i, 380; (HANTZSCH and WITZ), A., i, 402.
- Benzylidenebutyrylhydrazone** (BONGERT), A., i, 410.
- Benzylideneecamphor**, *o*- and *p*-bromo- (HALLER and MINGUIN), A., i, 600.
- Benzylidenedianiline anhydrosulphite** and the action of water on, and *m*-nitro- (EIBNER), A., i, 378.
- Benzylidenediindazole** (FISCHER and SEUFFERT), A., i, 411.
- Benzylidene- $\beta\delta$ -diphenylsemithiocarbazide** and its methyl derivative (BUSCH and HOLZMANN), A., i, 234.
- Benzylidenedi-2:4:5-trimethylbenzylhydrazine** (CURTIUS and FRANZEN), A., i, 293.
- Benzylidenefluorylhydrazine** (DIELS), A., i, 522.
- α -Benzylidenehydrindone** and its oxime and phenylhydrazone (SCHMID), A., i, 210.
- Benzylideneindanedione**, *p*-amino- (NÖTING and BLUM), A., i, 728.
- Benzylideneindene** (THIELE), A., i, 76.
- Benzylidenementhone**, preparation of (MARTINE), A., i, 599.
- Benzylidene- α -methyl-, - α -ethyl-, - α -propyl-, and - α -amyl-anhydrazetonebenzils** (JAPP and MELDRUM), T., 1030; P., 1901, 175.
- Benzylidene-1-methylazimino-*m*-toluidine** (PINNOW), A., i, 485.

- Benzylidene-2-methylsemicarbazone** and *m*-nitro- (YOUNG and OATES), T., 662; P., 1901, 86.
- Benzylidene-4-methylsemithiocarbazone**, oxidation of, with ferric chloride (YOUNG and EYRE), T., 59; P., 1900, 188.
- Benzylidene- β -naphthol**, amino-, and its hydrochloride and diacetyl derivative (BETTI), A., i, 611.
- Benzylidene- β -naphthylamine- β -naphthol** (BETTI and SPERONI), A., i, 81.
- Benzylidenenitrophthalide** and its isomeride (LEUPOLD), A., i, 711.
- Benzylidene-*o*-phenetidine** (JACOBSON and STEINERENCK), A., i, 380.
- Benzylidenephénylguanazole** (PELLIZZARI and RONCAGLIOLI), A., i, 772.
- Benzylidenephénylglcolohydrazide** (CURTIUS and MÜLLER), A., i, 779.
- Benzylidenephénylhydrazine- α - and - β -naphthols** (BETTI and SPERONI), A., i, 778.
- Benzylidene-4-phenylsemithiocarbazone**, oxidation of, with ferric chloride (YOUNG and EYRE), T., 60; P., 1900, 189.
- Benzylidenephthalide**, *m*-nitro- (LEUPOLD), A., i, 711.
- Benzylidenepropiophenone** and its dibromide and phenylhydrazone and its condensation with phenyl ethyl ketone (ABELL), T., 932; P., 1901, 128.
- Benzylidenesemicarbazide** (HOLROYD), T., 1326; P., 1901, 197.
- Benzylidenesemithiocarbazone**, oxidation of, by ferric chloride (YOUNG and EYRE), T., 54; P., 1900, 188.
- Benzylidene-*p*-toluidine**, isomeric, and its methiodide and ethiodide (HANTZSCH and SCHWAB), A., i, 379.
- Benzylidene-*o*-xylylenehydrazine** (FRÄNKEL), A., i, 44.
- θ -Benzylmalamic acids**, *d*-, *l*-, and *i*-, and their metallic and benzylamine salts, methyl ester, and amides (LUTZ), A., i, 8.
- d*- α -Benzylmalamide** (LUTZ), A., i, 10.
- 5-Benzylmercapto-2-phenylimino-3-phenyloxidiazoline** (WHEELER and DESTIN), A., i, 26.
- m*-Benzylmethylaminobenzenesulphonic acid** and its salts (GNEHM and SCHUTZ), A., i, 520.
- Benzylmethylaminophénylgyoxylic acid** (BOEHRINGER & SONS), A., i, 714.
- d*- β -Benzylmethylmalamide** (LUTZ), A., i, 10.
- μ -Benzylxyphenylcarbamide** (SPIEGEL and SABBATH), A., i, 534.
- Benzylphenyl-**. See Phenylbenzyl.
- Benzylpiperidinium-bromo-, -chloro-, -iodo-, and -hydroxy-acetic acids**, ethyl esters (WEDEKIND), A., i, 639.
- Benzyl isopropyl ketone** and its semicarbazone (BLAISE), A., i, 253.
- Benzylpyridines**, 2- and 3-, and their salts (TSCHITSCHIBABIN), A., i, 484.
- Benzylsulphonic acid**. See Toluene- ω -sulphonic acid.
- Benzyl-*p*-toluidine** and **Benzyltolylbenzenesulphonamide** (AFITZSCH), A., i, 138.
- Benzyl-*o*-, -*m*-, and -*p*-toluidines**, *m*-nitro-, and their hydrochlorides (PURGOTTI and MONTI), A., i, 22.
- 2-Benzyl-2-*o*-tolylidiketohydrindene** (GOLDBERG), A., i, 33.
- γ -Benzylvaleric acid**, *dithio*-, and its ethyl ester (POSNER and DEINHARDT), A., i, 703.
- 3-Benzylxanthine** (BOEHRINGER & SONS), A., i, 770.
- Bergamot oil**, wild, constituents of (BRANDEL and KREMERS), A., i, 598.
- Berlin blue**, formation of (MATUSCHEK), A., i, 635, 636, 677.
- Berzelianite** from the Skrickerum mine, Sweden (SVEDMARK), A., ii, 604.
- Bessemer processes**, open hearth and basic, spectra of flames from (HARTLEY and RAMAGE), A., ii, 366.
- Betaine**, compound of, with water (BREDIG), A., i, 608.
- Betitol** from beetroot (V. LIPPMANN), A., i, 390.
- Beverages**, detection and estimation of "dulcin" in (BELLIER), A., ii, 50.
estimation of "saccharin" in (DELLE), A., ii, 46; (DÉFOURNEL), A., ii, 588.
- Bignonia Tecoma***, colouring matter of (LEE), T., 284; P., 1901, 4.
- Bile**, variations in the composition of (CRACIUNU), A., ii, 459.
secretion and composition of (BRAND), A., ii, 459.
functions of, as a solvent (MOORE and PARKER), A., ii, 402.
elimination of sodium salicylate by the (LINOSSIER), A., ii, 564.
of the polar bear (HAMMARSTEN), A., ii, 520.
- Bilifuscin** (v. ZUMBUSCH), A., i, 283.
- Bilirubin**, formula of (ORNDORFF and TEEPLE), A., i, 602.
oxidation of, by ammonium persulphate (HUGOUNENQ), A., i, 242.
detection of, in urine by Ehrlich's diazo-reaction (PROSCHER), A., ii, 296.

- Biotite** from Butte, Montana (WEED), A., ii, 65.
from the Tatra Mountains (GORAZDOWSKI), A., ii, 170.
- Birds**, acid poisoning in (MILROY), A., ii, 611.
formation of uric acid in the liver of (KOWALEWSKI and SALASKIN), A., ii, 671.
- Bisazoxyacetic acid** ("triazoxyacetic acid") and its salts (HANTZSCH and LEHMANN), A., i, 132.
- Bisazoxymethane** (HANTZSCH and LEHMANN), A., i, 132.
- 2:4-Bisbenzenezoresorcinol** methyl ether (ORNDORFF and THEBAUD), A., i, 775.
- Bisdiazomethane**. See Dihydotetrazine.
- Bisdihydrophenanthrene**, bisnitro-, and **Bisdihydrophenanthrylene** (*bisphenanthran*), *mono*- and *di*-nitro- (SCHMIDT), A., i, 77.
- Bis-*p*-dimethyl-*o*-carboxycinnamic** and **Bis-*p*-dimethylphthalic acids** from the oxidation of bisdihydrosantonic acid (GRASSI-CRISTALDI and TOMARCHIO), A., i, 35.
- Bisdinaphthaxanthoneamine** (FOSSE), A., i, 604.
- Bismarek-brown**, constituents of (TÄUBER and WALDER), A., i, 41.
- Bismuth salts**, isomorphism between, and the salts of the rare earths (BODMAN), A., ii, 454.
comparison of the action of reducing agents on (T. and C. T. TYRER), A., ii, 693.
 $\text{Bi}_2\text{O}_3\text{—N}_2\text{O}_5\text{—H}_2\text{O}$, normal and basic (VAN BENMELEN and RUTTEN), A., ii, 24.
- Bismuth chloride**, compounds of, with aniline and quinoline (SCHIFF), A., i, 375.
compound of, with pyridine (MONTMARTINI), A., i, 163.
haloids, compounds of, with organic bases (VANINO and HAUSER), A., i, 289.
basic nitrates (ALLAN), A., ii, 318.
caesium nitrate (WELLS, BEARDSLEY, JAMIESON, and METZGER), A., ii, 653.
oxide, hydrated (THIBAUT), A., ii, 106.
suboxide (TANATAR), A., ii, 553.
phosphate, soluble (MONTMARTINI and EGIDI), A., ii, 106.
orthophosphate (MONTMARTINI and EGIDI), A., ii, 62.
sulphide, action of hydrogen on (PÉLABON), A., ii, 165.
- Bismuth**, estimation of:—
estimation of, electrolytically (WIMMENAUER), A., ii, 424.
estimation of, volumetrically, in dressings (FRERICHS), A., ii, 201.
- Bis-*p*-nitrophenyl-hydroxy- and-methylcyanidine** (RAPPEPORT), A., i, 569.
- Bisryclopentadienecarboxylic acid** and its dimethyl ester and the tetrabromide of the ester (THIELE), A., i, 182.
- Bisphenyl-ethyl- and -propyl-pyrazolones** and their oxidation products (BLAISE), A., i, 363.
- Bisphenylpropylpyrazolone** (BONGERT), A., i, 409.
- Bitter substances**, behaviour of acid aqueous solutions of, towards different solvents, and resisting power of, to putrefaction (PROELSS), A., ii, 706.
- Bitumen**, estimation of sulphur in (PELLET), A., ii, 622.
- Bleaching powder**, formation and constitution of (v. TIESENHOLT), A., ii, 155; (DITZ), A., ii, 239.
- Bleaching power** of persulphates (NAMIAS), A., ii, 16.
- Blödit** from Hallstatt (KOECHLIN), A., ii, 64.
- Blood**, method of distinguishing varieties of (UHLENHUTH), A., ii, 325.
animal and human, hæmoglobin crystals for the distinction of (MOSER), A., ii, 712.
action of hydrogen peroxide on: differentiating between the blood of man from that of animals (COTTON), A., ii, 295.
oxidation of, by ammonium persulphate (HUGOUNEQ), A., i, 242.
physico-chemical properties of (OKER-BLOM), A., ii, 326.
spectral reactions of, in presence of formaldehyde (TOLLENS), A., i, 492.
alkalinity of the (WALDVOGEL), A., ii, 116.
composition of the, in fevers (v. STEJSKAL), A., ii, 404.
calcium and sodium citrates in the coagulation of (SABBATANI), A., ii, 175.
effect of intravenous injection of milk on the coagulability of the (CAMUS), A., ii, 116.
the rennet and anti-rennet-like action of (FULD and SPIRO), A., ii, 67.
action of chloroform on the reducing power of (LAMBERT and GARNIER), A., ii, 257.
carbon monoxide in (NICLOUX), A., ii, 518.

- Blood**, maternal and foetal, amount of carbon monoxide in (NICLOUX), A., ii, 608.
 colouring matters of, absorption spectra of (FORMÁNEK), A., ii, 711.
 amount of fat in (BÖNNINGER), A., ii, 325.
 human, fat of (ENGELHARDT), A., ii, 665.
 relationship of iron in the, and in the urine (JOLLES and WINKLER), A., ii, 30.
 formation of lactic acid in the (ASHER and JACKSON), A., ii, 563.
 new reducing substance in the (MAYER), A., ii, 563.
 nature of the sugar in (PAVY and SIAU), A., ii, 257.
 the sugars of the (LÉPINE and BOULUD), A., ii, 610.
 glycolytic decomposition of sugars in (PORTIER), A., ii, 116.
 of animals deprived of their suprarenals (LEVIN), A., ii, 256, 518.
 dextrose in normal hens' (SAITO and KATSUYAMA), A., ii, 404.
 value of the hæmatoporphyrin test for the forensic detection of (IPSEN), A., ii, 296.
 detection of carbon monoxide in (KOSTIN), A., ii, 281.
 detection of hæmin in (RICHTER), A., ii, 296.
 estimation of fat in (BÖNNINGER), A., ii, 325.
 new instrument for the estimation of hæmoglobin in (GAERTNER), A., ii, 712.
 estimation of reducing sugars in (MEILLÈRE and CHAPELLE), A., ii, 354.
- Blood corpuscles**, red, osmotic phenomena of (QUINTON), A., ii, 256.
 mechanism of the action of (NOLF), A., ii, 256.
 affinity of, for acids and alkalis, and the resistance so produced towards solanine (HÉDON), A., ii, 611.
 permeability of, for NO_3 and SO_4 ions (HAMBURGER), A., ii, 175.
 behaviour of, to certain reagents (STEWART), A., ii, 457.
- Blood rain**. See under Water.
- Blood serum**, immediate action of intravenous injection of (BRODIE), A., ii, 118.
 origin of the alexin of (GENGOT), A., ii, 256.
- Blood vessels**, action of carbon dioxide on (BAYLISS), A., ii, 404.
- Blowpipe**, a kerosene oil (RICHARDSON), P., 1901, 151.
- Bog earths** of Bad-Sülze and Gölldenitz, composition of (HOFFMANN), A., ii, 188.
- Boilers**, analysis and softening of feed-water for (GIORGIS and FELICIANI), A., ii, 581.
- Boiling point**, new method for the exact determination of (SMITS), A., ii, 5.
 modification of Landsberger's apparatus for the determination of the elevation of the (RIIBER), A., ii, 372.
- Boiling point curve** of mixtures of ethyl alcohol and water (NOYES and WARFEL), A., ii, 594.
- Boiling points** in the series of normal primary mono- and di-amines (HENRY), A., i, 128.
 of binary mixtures, influence of foreign substances on the (SCHREINEMAKERS), A., ii, 445, 641.
 of some organic liquids (LONGINESCU), A., ii, 640.
- Bone**, glucoproteid of (HAWK and GIES), A., i, 298 ; ii, 520.
- Bone-black**. See Animal charcoal.
- Bone-fat**, analysis of (MENNICKE), A., ii, 138.
- Bone meal**, detection of mineral phosphates in (v. LORENZ), A., ii, 193.
 the citric acid solubility of the phosphoric acid in (METHNER), A., ii, 278.
 See also Agricultural Chemistry.
- Boracite**, influence of the presence of iron on the change in state of (RINNE), A., ii, 111.
- Borax**. See Sodium baborate.
- Bordorezen** (TSCHIRCH and BRÜNING), A., i, 221.
- Borimide** and its hydrochloride, and the action of ammonia and sulphur on (STOCK and BLIX), A., ii, 650.
- p*-**Borobenzoic acid** and its salts (MICHAELIS and RICHTER), A., i, 356.
- Boron bromide**, action of, on arsenic and antimony haloids and on phosphorus iodides (TARBLE), A., ii, 153.
 action of hydrogen arsenide on (STOCK), A., ii, 382.
 action of hydrogen sulphide on (STOCK and POPPENBERG), A., ii, 237 ; (STOCK and BLIX), A., ii, 650.
 compounds of, with phosphorus chlorides (TARBLE), A., ii, 153.
 hydrides (RAMSAY and HATFIELD), P., 1901, 152.
- Borides**, metallic, new (TUCKER and MOODY), P., 1901, 129.

Boron:—

- Boric acid**, volatility of, in steam (SKIRROW), A., ii, 448.
 influence of, on metabolism in children (TUNNICLIFFE and ROSENHEIM; GRÜNBAUM), A., ii, 517.
 Italian crude, analysis of (ZSCHIMMER), A., ii, 194.
 estimation of (CARNIELLI), A., ii, 690.
 test for, with turmeric paper, in food products (JENKINS and OGDEN), A., ii, 346.
 estimation of, in borates of the alkalis and alkaline earths (WOLFF), A., ii, 346.
 estimation of, in dressings (FRIEDRICH), A., ii, 204.
 estimation of, in food (LÜHRIG), A., ii, 280.
Perborates (TANATAR; CONSTAM and BENNETT), A., ii, 314.
 constitution of the (CONSTAM and BENNETT), A., ii, 17.
Metathioboric acid (STOCK and POPPENBERG), A., ii, 237.
Boron nitride (STOCK and BLIX), A., ii, 651.
 sulphide, compounds of, with boron bromide and chloride, and with ammonia (STOCK and BLIX), A., ii, 650.
Boron compounds, aromatic (MICHAELIS), A., i, 355.
Boronatocalcite. See Ulexite.
Bos-osteoplasimide (ÉTARD), A., i, 490.
Brain tissue, chemical composition of (WÖRNER and THIERFELDER), A., i, 176.
Brandies, marc and plum, analysis of (ZEGA), A., ii, 697.
Brandy flavouring essences, analysis of (BEYTHIEN and BOHRISH), A., ii, 285.
 testing, the furfuraldehyde reaction in (WETZKE), A., ii, 285.
Brassamine and its salts and benzoyl derivative (KRAFFT and TRITSCHLER), A., i, 116.
Brassic acid, methyl ester, and chloride (MEYER), A., i, 623.
Brassic chloride, amide, and nitrile (KRAFFT and TRITSCHLER), A., i, 116.
n-**Brassylic acid** from undecenoic acid (KRAFFT and SELDIS), A., i, 115.
 synthesis of (WALKER and LUMSDEN), T., 1196.
Brazilic and Brazilinic acids (GILBODY, PERKIN, and YATES), T., 1399; P., 1899, 27, 75, 241; 1900, 105.
Brazilein (HERZIG and POLLAK), A., i, 478.

- Brazilin**, constitution of (GILBODY, PERKIN, and YATES), T., 1396; P., 1899, 27, 75, 241; 1900, 105; (HERZIG and POLLAK), A., i, 478.
Brewers' grains, pentosans of (SCHÖNE and TOLLENS), A., ii, 414.
Brewing materials, test for arsenic in (CHAPMAN; ALLEN; REPORT OF THE COMMISSION TO THE MANCHESTER BREWERS' CENTRAL ASSOCIATION), A., ii, 125; (THOMSON and SHENTON), A., ii, 345.
Bridged rings, synthetical formation of (PERKIN and THORPE), T., 729; P., 1900, 149; 1901, 110.
Brögerite from Raade, Norway (HOFMANN and HEIDEPRIEM), A., ii, 396.
Bromal, chemico-toxicological detection and estimation of (VITALI), A., ii, 480, 534.
 diacetate ($\beta\beta\beta$ -tribromoethylidene diacetate) (GABUTTI), A., i, 11.
Bromelin proteolysis (MENDEL and UNDERHILL), A., i, 355.
Bromination of alkylbenzenes (EDINGER and GOLDBERG), A., i, 23.
Bromine, refractive index and dispersion of (RIVIÈRE), A., ii, 1.
 action of, on chlorine heptoxide and on perchloric acid (MICHAEL and COHN), A., ii, 152.
Hydrobromic acid (*hydrogen bromide*), action of, on carbohydrates (FENTON and GOSTLING), T., 361; P., 1901, 22.
 slow action of, on glass (BERTHELOT), A., ii, 19.
 action of silver on, and the inverse reaction (JOUNIAUX), A., ii, 601.
Bromates, detection of, by strychnine (FAGES), A., ii, 191.
Bromoamides, velocity of intramolecular migration of, under the influence of an alkali (VAN DAM and ABERSON), A., ii, 88.
Bromoform, chemico-toxicological detection and estimation of (VITALI), A., ii, 480, 534.
Bronzite from Bosnia (KIŠPATIĆ), A., ii, 321.
Brostenite from Roumania (PONI), A., ii, 26.
Brucine, action of bromine on (KIPPENBERGER), A., ii, 52.
Brushite from the Island of Mona, West Indies (KLEIN), A., ii, 558.
Bryopogonic acid and the *iso*-acid (HESSE), A., i, 595.
Buchu leaves, constituents of the oil of (KONDAKOFF and BACHTSCHÉEFF), A., i, 334.
Bucklandite. See Epidote.

- Buckwheat.** See Agricultural Chemistry.
- Buds.** See Agricultural Chemistry.
- Bullocks.** See Agricultural Chemistry.
- Burette,** new form of (THIELE), A., ii, 575.
- Burette calibrator,** Ostwald's, improved (CUSHMAN), A., ii, 596.
- Butaldehyde diethylacetal, γ -amino-** (WOHL and SCHAFER), A., i, 514.
- iso***Butaldehyde,** condensation of, with aromatic ortho-aldehydes (HERZOG and KRUH), A., i, 213.
- condensation of, with aniline (FRIEDJUNG and MOSSLER), A., i, 641.
- condensation of, with crotonaldehyde (PLATTENSTEINER), A., i, 254.
- condensation of, with *p*-hydroxy- and *p*-ethoxy-benzaldehydes (HILDESHEIMER), A., i, 645.
- condensation of, with propaldehyde (KOHN), A., i, 255.
- iso***Butaldol,** condensation of, with aniline (FRIEDJUNG and MOSSLER), A., i, 641.
- Butane, $\alpha\gamma$ -diamino-,** and its salts (TAFEL and WEINSCHENK), A., i, 72.
- $\beta\gamma$* -bromoamino-, and its picrate (STRAUSS), A., i, 17.
- $\alpha\delta$ -dibromo- and $\alpha\delta$ -diiodo-* (HAMONET), A., i, 247.
- or *$\alpha\delta$ -diiodo-*, action of zinc on (HAMONET), A., i, 305.
- iso***Butane, $\beta\gamma$ -dibromo-** (GUSTAVSON), A., i, 61.
- Butane- $\alpha\gamma$ -dicarboxy- β -acetic acid** (SKRAUP), A., i, 227.
- Butanedicarboxylic acids.** See :—
Adipic acid.
Dimethylsuccinic acids.
Ethylsuccinic acid.
Methylglutaric acid.
Propylmalonic acid.
- $\alpha\delta$* -**Butanediol** and its diacetyl derivative (HAMONET), A., i, 251.
- Butanetetra-carboxylic acid, dithio-,** ethyl ester (WENZEL), A., i, 403.
- See also *β* -Methylpropane- *$\alpha\beta\gamma\gamma$* -tetra-carboxylic acid.
- Butanol.** See Butyl alcohol.
- Butinene (ethylacetylene)** (WISLICENUS), A., i, 1; (WISLICENUS and SCHMIDT), A., i, 2.
- Butinene (crotonylene, dimethylacetylene)** and its *di-* and *tetra-*bromide and hydrobromide (WISLICENUS), A., i, 1; (WISLICENUS and SCHMIDT; WISLICENUS, TALBOT, and HENZE), A., i, 2.
- formation of (WISLICENUS and HENZE), A., i, 4.
- Butter,** cryoscopic distinction between margarine and (PESCHGES), A., ii, 630.
- analysis of (REYCHLER), A., ii, 208; (V. KLENZE), A., ii, 292.
- analysis of, and the Reichert-Meissl figure (SIEGFELD), A., ii, 482.
- Dntch, the Reichert-Meissl number of (KIRCHNER and RACINE), A., ii, 137.
- influence of the season and feeding on the Reichert-Meissl number of (SWAVING), A., ii, 587.
- detection of cocoanut oil in (INDEMANS), A., ii, 78; (RANWEZ), A., ii, 702.
- apparatus for the simultaneous estimation of fat and water in (PODA), A., ii, 482.
- estimation of, in margarine (REPORT OF JOINT COMMITTEE), A., ii, 77.
- See also Agricultural Chemistry.
- n*-**Butyl alcohol,** synthesis of (GUERBET), A., i, 625.
- γ -amino-, and the action of formaldehyde and nitrous acid on, and its dibenzoyl derivative (HENRY), A., i, 16.
- δ -amino- (HENRY), A., i, 68.
- iso***Butyl alcohol,** influence of, as solvent, on the rotation of ethyl tartrate (PATTERSON), T., 478; P., 1901, 40.
- sec.***Butyl alcohol, γ -amino- (2:3-amino-butanol)** and its platinichloride (STRAUSS), A., i, 17.
- d-sec.***Butylamine** and its hydrochloride and platinichloride (GADAMER), A., i, 582.
- iso***Butylanthranilic acid** (MEYER), A., i, 191.
- iso***Butylbenzene, nonabromo-** (BODROUX), A., i, 519, 523.
- Butylcinnamic acids, α - and *iso-*** (MICHAEL and HARTMAN), A., i, 358.
- iso***Butylene,** action of hypochlorous acid on (KRASSUSKY), A., i, 246.
- dibromide, action of, on benzene (BODROUX), A., i, 523.
- iso***Butylenechlorohydrins,** isomeric (MICHAEL), A., i, 625.
- Butylene glycol,** diamyl derivative (HAMONET), A., i, 187.
- ψ -**Butylenes (s-dimethylethylenes),** isomeric, and their bromo-derivatives and β -bromomonocarboxylic acids (WISLICENUS; WISLICENUS and SCHMIDT), A., i, 1; (WISLICENUS, TALBOT, and HENZE), A., i, 2.
- Butylene- ψ -thiocarbamide** and its picrate and platinichloride (STRAUSS), A., i, 17.

i-Butylenedianiline anhydrosulphite (EIBNER), A., i, 378.

β -Butylenecyclopentene (*methylthylfulvene*) diperoxide (ENGLER and FRANKENSTEIN), A., i, 658.

2-*iso*Butyl-4-ketodihydroquinazoline (GOTTHELF), A., i, 765.

p-*iso*Butyloxyphenyl-carbamide and -thiocarbamide (SPIEGEL and SABATH), A., i, 534.

*iso*Butyramide, nitro- (PILOTY and SCHWERIN), A., i, 517.

Butyric acid, α - and β -amino-, ethyl esters, and the hydrochloride and picrate of the α -acid (FISCHER), A., i, 192.

β -amino- and its ethyl ester, benzoyl derivative, and phenylcarbimide (FISCHER and ROEDER), A., i, 295.

α , γ -diamino-, synthesis of, and its salts and dibenzoyl derivative (FISCHER), A., i, 674.

α -iodo- (ZERNOFF), A., i, 185.

*iso*Butyric acid, nitroso-, its ethyl ester, amide, nitrile, and amidine (PILOTY and SCHWERIN), A., i, 516.

Butyrolactonecarboxylic acid, ethyl ester (TRAUBE and LEHMANN), A., i, 501.

Butyronitrile, latent heat of vaporisation and specific heat of (LUGININ), A., ii, 145.

Butyrorefractometer, Zeiss' (WHITE), A., ii, 207.

Butyrylactic acid, ethyl ester (BLAISE), A., i, 363.

Butyrylacetacetic acid, methyl ester (BONGERT), A., i, 653.

isomeric methyl esters (BOUVEAULT and BONGERT), A., i, 311.

action of hydrazine and phenylhydrazine on (BONGERT), A., i, 409.

nitration of (BOUVEAULT and BONGERT), A., i, 500.

Butyrylanilide, α -cyano- (HALLER and BLANC), A., i, 261.

Butyrylanilides, *n*- and *iso*-, α , β -dibromo- (AUTENRIETH and SPIESS), A., i, 199.

Butyryl*iso*butyric acid, ethyl ester (BLAISE), A., i, 252.

ω -Butyryl-2:4-diethoxyacetophenone (v. KOSTANECKI, TAMBOR, and WINTER), A., i, 559.

β -Butyrylglutaric acids, *n*- and *iso*-, and their salts and ketodilactones (FITIG and GUTHRIE), A., i, 121.

β -Butyryloxycrotonic acid, methyl ester (BOUVEAULT and BONGERT), A., i, 312.

Butyrylphenylhydrazine (BONGERT), A., i, 409.

C.

Cacodylic acid, physiological action of, and its detection in urine (HEFFTER), A., ii, 464.

elimination and toxicological detection of (BARTHE and PÉRY), A., ii, 364.

derivatives of (ASTRUC and MURCO), A., i, 144.

Cactaceæ, occurrence of alkaloids and saponins in (HEFFTER), A., i, 736; (HEYL), A., i, 738.

Cadmium, melting point of (HOLBORN and DAY), A., ii, 85.

Cadmium amalgams (ROOZEBOOM), A., ii, 507.

Cadmium chloride, compounds of, with cupric oxide (MAILHE), A., ii, 601.

fluoride, solubility of (JAEGER), A., ii, 386.

haloids, compounds of, with aromatic amines and with pyridine (TOMBECK), A., i, 164.

oxide, natural (NEUMANN and WITTICH), A., ii, 605; (WITTICH and NEUMANN), A., ii, 663.

suboxide (TANATAR), A., ii, 553.

selenide and its double salt with cadmium iodide (FONZES-DIACON), A., ii, 60.

sulphate, heat of solution of (HOLBOER), A., ii, 226.

Cadmium, precipitation of, by hydrogen sulphide in acid solution (STULL), A., ii, 625.

Cæsium bromide, fluoride, hydrogen fluoride, and *mono*- and *di*-chromates (CHABRIÉ), A., ii, 314.

antimony bromide and chloride (WELLS and METZGER), A., ii, 661.

molybdenyl chloride (NORDENSKJÖLD), A., ii, 454.

thorium chlorides (WELLS and WILLIS), A., ii, 660.

antimony fluorides and iodide (WELLS and METZGER), A., ii, 514.

tellurium fluoride (WELLS and WILLIS), A., ii, 652.

periodate and hydrogen iodate-periodate (WELLS), A., ii, 653.

bismuth and ferric nitrates (WELLS, BEARDSLEY, JAMIESON, and METZGER), A., ii, 653.

acid nitrates (WELLS and METZGER), A., ii, 652.

nitropentachloro-osmate (WERNER and DINKLAGE), A., ii, 661.

sulphate, double salt of, with indium sulphate (CHABRIÉ and RENGADE), A., ii, 102.

rhodium alum (PICCINI and MARINO), A., ii, 392.

- Cæsium sulphur compounds** (CHABRIÉ), A., ii, 600.
- Cæsium**, precipitation of, from its solutions (WELLS), A., ii, 652.
- Caffeine** and the salts it forms (PAUL), A., i, 341.
- localisation of, in tea leaves (SUZUKI), A., ii, 680.
- amount of, in different parts of the tea plant (SUZUKI), A., ii, 679.
- synthesis of, from cyanoacetic acid (TRAUBE), A., i, 54.
- ethobromide (ROSSOLIMO), A., i, 480.
- ethochloride and ethioidide (ROSSOLIMO), A., i, 161.
- influence of, on nitrogenous excretion (RIBAUT), A., ii, 565.
- influence of, on the excretion of purine substances in the urine (KRÜGER and SCHMID), A., ii, 463.
- detection of (NESTLER), A., ii, 432.
- Caffetannic acid**, and its salts and hexaacetyl derivative (RUNDQVIST), A., i, 724.
- Calamus oil**, crystalline compound from (V. SODEN and ROJAHN), A., i, 395; (THOMAS and BECKSTROEM), A., i, 396.
- Calaverite** from Western Australia (KRUSCH), A., ii, 393.
- See also Tellurides.
- Calcareous concretions** of Kettle Point, Ontario (DALY), A., ii, 516.
- Calcite**, simple method of distinguishing aragonite and (MEIGEN), A., ii, 692.
- Calcium**, atomic weight of (HERZFELD and STIEPEL), A., ii, 239.
- Calcium amalgam** (SCHÜRGER), A., ii, 97.
- Calcium compounds** in soil (MEYER), A., ii, 273.
- Calcium aluminates**, sulpho-aluminates, and silicates, action of magnesium salts, sodium chloride, and of sea water on (REBUFFAT), A., ii, 385.
- borate (OUVRARD), A., ii, 158.
- carbide, action of, on fatty alcohols (LEPEBVRE), A., i, 441.
- action of a solution of formaldehyde on (VANINO), A., i, 125.
- reducing action of (V. KÜGELGEN), A., ii, 98, 448; (NEUMANN), A., ii, 98.
- carbonate. See Agricultural Chemistry and Conchite.
- chlorate, decomposition of (SODEAU), T., 247; P., 1900, 209.
- chloride, indices of refraction of solutions of (BREMER), A., ii, 141.
- electrolysis of (TUCKER and MOODY), A., ii, 98.
- Calcium chloride**, combination of, with ammonia in aqueous solution (DAWSON and McCRAE), T., 1069; P., 1901, 177.
- double salt of, with antimony pentachloride (WEINLAND and SCHLEGELMILCH), A., ii, 660.
- apparatus, new (HENNING), A., ii, 420.
- chromates, solubility of, in water (DIETZ, FUNK, v. WROCHEM, and MYLIUS), A., ii, 104.
- oxide, crystallised (JOUVE), A., ii, 384.
- oxide (*lime*), solubility of, in water, at different temperatures (GUTHRIE), A., ii, 315.
- estimation of soluble, in London purple (HAYWOOD), A., ii, 126.
- estimation of, in soils (HOTTER), A., ii, 623.
- phosphate. See Agricultural Chemistry.
- sulphide, preparation and crystalline form of (MÜLLER), A., ii, 60.
- Calcium organic compounds**:—
- ferrieyanides (FISCHER and MÜLLER), A., i, 455.
- haloids, compounds of, with aromatic amines (TOMBECK), A., i, 135.
- Calcium**, estimation of:—
- estimation of assimilable (MEYER), A., ii, 273.
- estimation of, in presence of much iron oxide (PELLET), A., ii, 477.
- estimation of, as the oxalate (PETERS), A., ii, 692.
- estimation of, in high-grade ferro-silicon (GRAY), A., ii, 578.
- estimation of, in soil by the citrate method (PASSON), A., ii, 347.
- estimation of, in waters (GASSELIN), A., ii, 133; (WINKLER), A., ii, 347.
- Calculi** from the pancreas, composition of (LEGRAND), A., ii, 566.
- Callitrolic acid** and its lactone (HENRY), T., 1158; P., 1901, 187.
- Calorific value** of fuels, determination of the (REBUFFAT), A., ii, 373.
- Berthier's method for determining the (ANTONY and DI NOLA), A., ii, 6.
- Camphanamic acid** and the action of sodium hypobromite and sodium hydroxide on (LAPWORTH and LENTON), T., 1290; P., 1901, 38.
- Camphanamide**, preparation of, and action of dehydrating agents on (LAPWORTH and LENTON), T., 1289; P., 1901, 38.

- Camphane**, 1-bromo-1-nitro-, hydroxyl-amine derivative of, its salts and carbamide and benzoyl derivatives, and the action of caustic soda and of nitrous acid on, and oxidation of (FORSTER), T., 654; P., 1901, 88.
- 2-bromo-1-nitro-, 1:2-dibromo-1-nitro-, and 2-iodo-1-nitro- (FORSTER), T., 647; P., 1901, 85.
- dichloro-, action of sulphuric acid on (BREDT, ROCHUSSEN, and MONHEIM), A., i, 217.
- Camphane anhydride**, 1:1-chloronitro-, and its isomeride and benzoyl and nitro-derivatives, and hydroxylamino-derivative and its benzoyl compound (FORSTER and ROBERTSON), T., 1006; P., 1901, 169.
- Camphanic acid**, constitution of (LAPWORTH and LENTON), T., 1284; P., 1901, 37.
- Camphanonitrile**, and the action of alkalis on (LAPWORTH and LENTON), T., 1291; P., 1901, 38.
- Camphene** and its bromo-derivatives, hydrobromide, hydrochloride, and alcoholate (SEMMLER), A., i, 90.
- action of nitric anhydride on, and constitution of (DEMJANOFF), A., i, 554.
- hydriodide (KONDAKOFF and LUTSCHININ), A., i, 282.
- relation of, to artificial camphor (KONDAKOFF), A., i, 646.
- Camphene**, 1-amino-, and its salts and benzoyl, benzylidene, and phenyl-carbamide derivatives, and 1-nitro- (FORSTER), T., 646; P., 1901, 85.
- Campheride**, triacetyl, trimethyl, and di- and tri-ethyl derivatives of (TESTONI), A., i, 93.
- Campherol** (PERKIN and WILKINSON), P., 1900, 182; (PERKIN), P., 1901, 87.
- Camphocean ring**, resolution of the (BREDT, ROCHUSSEN, and MONHEIM), A., i, 218.
- Camphoformeneaminecarboxylic acid** and its amide (TINGLE), A., i, 632.
- Camphoformene-methylaminecarboxymethylamide**, and -ethylaminecarboxyethylamide (TINGLE), A., i, 633.
- Campholytic acid**, constitution of (FORSTER), T., 110; (TIEMANN, KERSCHBAUM, and TIGGES), A., i, 6; (BLANC), A., i, 10.
- r*-**Campholytic acid** and Δ^5 -**Campholytic acid** and its amide (NOYES and BLANCHARD), A., i, 664.
- Campholytic acids**, isomeric, and their oxidation products (TIEMANN, KERSCHBAUM, and TIGGES), A., i, 5.
- See also *iso*Launonic acid.
- Campholytolactone**, and the acid, $C_9H_{16}O_3$, from its hydrolysis (TIEMANN, KERSCHBAUM, and TIGGES), A., i, 5; (BLANC), A., i, 10.
- iso***Campholytonic acid** (*isolaunonic acid*) (TIEMANN, KERSCHBAUM, and TIGGES), A., i, 6.
- Camphonic acid**, formula of (LAPWORTH and LENTON), P., 1901, 148.
- Camphononic acid**, formation of (LAPWORTH and LENTON), T., 1287; P., 1901, 38.
- formula of (LAPWORTH and LENTON), P., 1901, 149.
- Camphopyric acid**, and its anhydride and anilide (WALLACH and NEUMANN), A., i, 333.
- Camphor** excreted by *Polyzonium rosabulum* (COOK), A., ii, 179.
- constitution of (ASCHAN), A., i, 477.
- artificial, constitution of (KONDAKOFF), A., i, 646.
- action of sulphuric acid on (BREDT, ROCHUSSEN, and MONHEIM), A., i, 217.
- combination of, with β -hydroxy- α -naphthaldehyde (HELBRONNER), A., i, 600.
- estimation of, in camphor oil (LÖHR), A., ii, 361.
- Camphor**, α -bromo-, racemisation of (KIPPING), T., 370; P., 1901, 32.
- α -dibromo-, constitution of the acids from, and the action of moist silver compounds on (LAPWORTH and LENTON), P., 1901, 148.
- Camphorenic acid**, bromo-, formula of (LAPWORTH and LENTON), P., 1901, 148.
- Camphor group**, syntheses of compounds of the, in the organism (HILDEBRANDT), A., ii, 180, 669.
- Camphoric acid**, constitution of (BLANC), A., i, 10.
- phenetidide (GOLDSCHMIDT), A., i, 590.
- apo***Camphoric acid** (*mesocamphopyric acid*), synthesis of (KOMPPA), A., i, 668.
- Camphoric anhydride**, action of aluminium chloride on (LEES and PERKIN), T., 332; P., 1898, 111; 1899, 23; 1900, 18; (PERKIN and YATES), T., 1373.
- bromo-, constitution of (LAPWORTH and LENTON), T., 1284; P., 1901, 38.
- α -**Camphornitrilamide** and its oxidation products (TIEMANN and TIGGES), A., i, 20.
- β -**Camphornitrilic acid**, constitution of, and the products of oxidation of its amide (TIEMANN and TIGGES), A., i, 19.

- Camphornitrilic acids**, α - and β - (TIE-MANN, LEMME, and KERSCHBAUM), A., i, 18.
- Camphor oil**, estimation of camphor in (LÖHR), A., ii, 361.
- isocamphoronic acid**, synthesis of (PERKIN), P., 1900, 214.
- Camphoroxalic acid**, derivatives (TINGLE), A., i, 632.
- Camphoroxime**, mixed crystals of (ADRIANI), A., ii, 230.
reactions of (KONOWALOFF), A., i, 281.
- Camphorquinone**, preparation of, and its *p*-bromophenylhydrazone and semicarbazone (LAPWORTH and CHAPMAN), T., 380; P., 1901, 28.
- Camphor ring**, disruption of the (TIE-MANN, LEMME, and KERSCHBAUM), A., i, 18.
- Camphor- α - and - α' -sulphonic acids** and their amides, anilides, bromides, chlorides, and piperidides, and bromo- and chloro-derivatives (ARMSTRONG and LOWRY), P., 1901, 182.
- Canarin** (GOLDBERG), A., i, 193, 516, 677.
preparation of (PAWLEWSKI), A., i, 71.
- Cane-sugar**. See Sucrose.
- Cantharidin** and cantharidin-immunity (ELLINGER), A., ii, 180.
nitrogen derivatives of (MEYER), A., i, 221.
- Caoutchouc** (*indiarubber*), action of nitrous acid on (HARRIES), A., i, 734.
- Capaloin**. See Uganda-aloin.
- Capillarity**, theory of (BAKKER), A., ii, 88, 374.
of aqueous sucrose solutions (DOMKE, HARTING, and PLATO), A., i, 189.
- Capillary constants** of organic liquids (GUVE and BAUD), A., ii, 437, 543.
- Capillary-electrical phenomena** (PALMAER), A., ii, 370.
- Capillary layer** between the homogeneous phases of liquid and vapour, theory of the (BAKKER), A., ii, 88.
- Capillary phenomena**, deductions from (EINSTEIN), A., ii, 228.
- Caproic acid**. See Hexoic acid.
- Caramelan**, decomposition products of (STOLLE), A., i, 673.
- Carbamic acid**, methyl-*n*-butylcarbiny ester (FARBENFABRIKEN VORM. F. BAVER & Co.), A., i, 663.
- Carbamide**, formation of, by the oxidation of albumin (HUGOUNENQ), A., i, 491; (SCHULZ), A., i, 780.
as the product of oxidation of nitrogenous substances (JOLLES), A., i, 30, 262, 583.
formation of, by the oxidation of physiological nitrogenous substances (FALTA), A., ii, 705.
- Carbamide**, spontaneous conversion of uric acid into (GIGLI), A., i, 677.
relation between the solubility and heat of solution of (CAMPETTI), A., ii, 642.
decomposition of, by urease, and by katabolism (BEYERINCK), A., ii, 264.
condensation of, with acetone (WEIN-SCHENK), A., i, 583.
action of, on oxalacetic acid (FENTON and JONES), T., 96; P., 1900, 205.
condensation of, with sugars (SCHOORL), A., i, 258.
action of aromatic sulphonic chlorides on (REMSEN and GARNER), A., i, 270.
action of the chlorides of *o*-sulpho- and *p*-nitro-*o*-sulpho-benzoic acids on (HOLMES), A., i, 271.
oxygen ethers of (McKEE), A., i, 757.
See also Urea.
- Carbamide**, nitro-, electrolytic reduction of (HOLROYD), T., 1326; P., 1901, 197.
thio-. See Thiocarbamide.
- Carbaminoozocyanide** (*aminohydroxy-methyleyanotriazen*) (HANTZSCH and VAGT), A., i, 195.
- Carbaminodiacetic acid**, diethyl ester (FISCHER), A., i, 192.
- Carbaminoglycylglycine**, ethyl ester (FISCHER and FOURNEAU), A., i, 675.
- Carbaminoinminoazoimide** and its salts (HANTZSCH and VAGT), A., i, 195.
- Carbaminophenyliminodisulphide** and its hydrobromide, hydrochloride, bromo-derivative and tetrabromide (HUGERSHOFF), A., i, 757.
- 1-Carbamino-5-pyrazolone-3-*p*-nitro-benzeneazoacetic acid**, ethyl ester (BÜLOW and HÖPFNER), A., i, 241.
- Carbanilinoacetophenoneoxime**, ω -chloro- and ω -bromo, and *m*-nitro- of the bromo-compound (KORTEN and SCHOLL), A., i, 549.
- Carbanilinodi- α -naphthylethylene-diamine** (SENIER and GOODWIN), T., 260; P., 1900, 229.
- Carbanilphenylethyldieneoxycyclo-triazan** (VOSWINCKEL), A., i, 53.
- Carbazinic acids**, dithio-, action of thiocarbimides on (BUSCH and WOLFERT), A., i, 233.
- Carbazole**, derivatives of (RUFF and STEIN), A., i, 620.
bromine derivatives of (VAUBEL), A., i, 652.
- Carbazoles**, formation of (JAPP and MATTLAND), P., 1901, 176.
- Carbethoxyglycylglycine**, ethyl ester (FISCHER and FOURNEAU), A., i, 675.

Carbimides, thio-. See Thiocarbimides.
Carbiminoacetyl-*p*-toluidide, thio- (FRERICHS and BECKURTS), A., i, 80.
Carbodiphenylimide (SCHALL), A., i, 766.
Carbofenchonone (WALLACH and V. WESTPHALEN), A., i, 332.
Carbohydrate metabolism in winter leaves (CZAPEK), A., ii, 571.
Carbohydrates of *Chondrus crispus* (SEBOR), A., i, 15.
 reserve, from *Lilium* bulbs (PARKIN), A., ii, 414.
 of the albumen of the seeds of *Phoenix canariensis* (BOURQUELOT and HÉRISSEY), A., ii, 619.
 refraction of aqueous solutions of (STOLLE), A., i, 368, 507.
 action of various Bacteria on (HARDEN), T., 610; P., 1901, 57.
 action of formaldehyde and benzaldehyde on (ALBERDA VAN EKENSTEIN), A., i, 120.
 action of hydrogen bromide on (FENTON and GOSTLING), T., 361; P., 1901, 22.
 behaviour of, with hypochlorites (BRÄUTIGAM), A., i, 671.
 influence of sodium fluoride on the action of seminae on the, in the albumen of seeds (HÉRISSEY), A., ii, 570.
 influence of, on the production of proteids in plants (SCHULZE), A., ii, 333.
 selection of, by yeasts during alcoholic fermentation (KNECHT), A., ii, 568.
 action of, on the vegetation of *Nostoc punctiforme* (BOUILHAC), A., ii, 571.
 salivary digestion of, in the stomach (HENSAY), A., ii, 666.
 amount of, in normal and diabetic urine (ROSIN; V. ALFTHAN), A., ii, 179.
 the so-called furfuraldehyde tests for (NEUBERG), A., ii, 356.
 estimation of, in human feces (STRASBURGER), A., ii, 357.
Carbohydrates. See also :—
 Acetylchloro-dextrose, -galactose, and -lactose.
 Apiose.
 Arabinoses.
 Bassorin.
 Cellose.
 Celluloses.
 Dextrin.
 Dextrose.
l-Erythrose.

LXXX. ii.

Carbohydrates. See :—

d-Fructose.
 Galactose.
 Gentianose.
 Gentiobiose.
 Glucose.
 Glycogen.
 Grammin.
 Hydrocellulose.
 Inulin.
 Lactose.
 Laevulose.
 Maltose.
*iso*Maltose.
 Mannitol.
 Mannose.
 Melitriose.
 Oxycelluloses.
 Pectins.
 Pentosans.
 Pentoses.
 Raffinose.
 Rhamnose.
 Rhodose.
 Starch.
 Sucrose.
l-Threose.
 Tragacanthose.
 Triacetylchloroarabinose.
 Trimethyltriase.
Carbohydrazides of the dihydroxybenzenes, condensation of, with mixed aromatic and fatty ketones (EINHORN and ESCALES), A., i, 652.
Carbolic acid, estimation of, in dressings (FRERICHS), A., ii, 203.
 See also Phenol.
Carbon, tervalent (GOMBERG), A., i, 77, 319, 374, 638; (NORRIS), A., i, 198.
 formation of, during the electrolysis of ammonium oxalate (VERWER), A., ii, 693.
 spectra of (LEHMANN), A., ii, 142.
 direct union of, with hydrogen (BONE and JERDAN), T., 1042; P., 1901, 162.
 reducing action of, on metallic compounds (BOUDOUARD), A., ii, 314.
 analogies between nitrogen, oxygen and, in similar linkings (ERLENMEYER), A., i, 61.
Carbon chloride, $C_{12}Cl_{14}$ (FRANCESCO and RECCHI), A., i, 721.
Carbon monoxide (carbonic oxide), and oxygen, reactions of, in presence of alkalis (BERTHELOT), A., ii, 17.
 action of cuprous salts on (BERTHELOT), A., i, 493.
 behaviour of, towards silver (BERTHELOT), A., ii, 97.

- Carbon monoxide** (*carbonic oxide*) in blood (NICLOUX), A., ii, 518.
 poisoning, treatment of, by oxygen (GRÉHANT), A., ii, 409.
 passage of, from mother to fœtus (NICLOUX), A., ii, 608.
 detection of, in air (ZUNTZ and KOSTIN), A., ii, 280; (KOSTIN), A., ii, 281.
 detection of, in blood (KOSTIN), A., ii, 281.
- Carbon dioxide** (*carbonic anhydride*), conductivity of (TOWNSEND and KIRKBY), A., ii, 434.
 latent heat of evaporation of (CROMPTON), P., 1901, 62.
 decomposition of, under electrical strain (COLLIE), T., 1063; P., 1901, 168.
 density of, in the solid and liquid state (BEHN), A., ii, 95.
 action of, on aqueous solutions of ferro- and ferri-cyanides (MATUSCHEK), A., i, 677.
 reaction of, with hydrogen (BOUDOUARD), A., ii, 383.
 produced by *Bacillus pyocyaneus* (PAKES and JOLLYMAN), T., 325; P., 1900, 189.
 evolution of, from the bacterial decomposition of formic acid (PAKES and JOLLYMAN), T., 386; P., 1901, 29.
 evolution of, by yeast (HARDEN and ROWLAND), T., 1228; P., 1901, 189.
 assimilation of, by hyphomicrobium and nitromicrobium (STUTZER), A., ii, 267.
 influence of, on fermentation (ORTLOFF), A., ii, 262.
 action of, on smooth muscle (CLEGHORN and LLOYD), A., ii, 255.
 action of, on blood vessels (BAYLISS), A., ii, 404.
 improved Geissler potash apparatus for the absorption of (WETZEL), A., ii, 74.
 analysis of mixtures of carbonyl sulphide, hydrogen sulphide and (HEMPEL), A., ii, 651.
 estimation of, in air (HALDANE), A., ii, 477.
 estimation of, in water (ELMS and BENEKER), A., ii, 627.
 estimation of, in natural waters (WINKLER), A., ii, 696.
- Carbon disulphide**, compound of, with aluminium bromide and bromine (PLOTNIKOFF), A., ii, 316.
- Carbon, estimation of:—**
 estimation of, in ferrochrome (BLAIR), A., ii, 74.
- Carbon, estimation of:—**
 estimation of, in iron and steel (SCHMITZ), A., ii, 691.
 apparatus for the estimation of, in iron and steel (GÖCKEL), A., ii, 39.
 rapid estimation of, in steel (JOB and DAVIES), A., ii, 127.
 organic, estimation of, in water (KÖNIG), A., ii, 351.
- Carbon combustions**, special crucible for (SHIMER), A., ii, 477.
- Carbon compounds**, spectra of (SMITH-ELLS), A., ii, 366; (BALY and SYERS), A., ii, 633.
 asymmetric, rotation of substituted (GUYE), T., 476; P., 1901, 48.
 colourless, new method of testing, for absorption of light (PINNOW), A., ii, 368.
- Carbonic acid**, constitution of the hydroxyl groups of (CAZENEUVE), A., i, 497.
- Carbonic diethyl ether**, imino-, preparation of (LANDER), T., 702; P., 1901, 61.
- Carbonyl chloride** (*phosgene*), action of, on diamines (SCHOLTZ and JAROSS), A., i, 485.
 action of lead thiocyanate on (DIXON), T., 552; P., 1901, 52.
 new reaction of (KÜHN), A., i, 42.
- Carbonyl sulphide** and analysis of mixtures of hydrogen sulphide, carbon dioxide and (HEMPEL), A., ii, 651.
- Carbonyl-dicarbamide**, -di- α - and - β -naphthylcarbamides, -diphenylcarbamide, and -di-*p*-tolylcarbamide (PICKARD and CARTER), T., 842; P., 1901, 123.
- Carbonyl-*p*-tolylcarbazine**, ethyl ester (BUSCH), A., i, 489.
- Carbostyryl**, physiological action of (v. FENYVESSY), A., ii, 31.
 nitro- and bromonitro-derivatives (DECKER), A., i, 654.
- ab-Carboxyamyl-phenyl- and -o-tolylthiocarbamide** (DORAN), T., 914; P., 1901, 130.
- Carboxyamylthiocarbimide** and its derivatives (DORAN), T., 906; P., 1901, 130.
- Carboxyanthranilic acid**, dimethyl and diethyl esters (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 709.
- 3-*p*-Carboxybenzoylpicolinic acid**, and its dimethyl ester and cadmium salt (FULDA), A., i, 226.
- o-Carboxycinnamic acid**, and its dibromide (LEUPOLD), A., i, 711.
- Carboxyhæmoglobin**. See under Hæmoglobin.

- 2-Carboxy-5-methoxyphenoxyacetic acid** and its salts (GILBODY, PERKIN, and YATES), T., 1400; P., 1899, 27, 75, 241; 1900, 105.
- Carboxymethylphenylsemithiocarbazide** (DORAN), T., 911; P., 1901, 130.
- Carboxymethylthiocarbamic acid**, esters (DORAN), T., 912; P., 1901, 130.
- ab*-**Carboxymethylthiocarbamide** and its aromatic and fatty alkyl derivatives (DORAN), T., 908; P., 1901, 130.
- Carboxymethylthiocarbimide** and its derivatives (DORAN), T., 906; P., 1901, 130.
- Carboxymethylthiourea** and **Carboxymethylpiperidylthiourea** (DORAN), T., 910; P., 1901, 130.
- Carboxyphenylbutyrolactoneacetic acid** and its salts (FITTIG and GOTTSCHÉ), A., i, 123.
- Carboxyphenylhydrazonocyanoacetic acid** and its methyl ethyl ester and salts (LAX), A., i, 231.
- o*-**Carboxyphenylmercuric hydroxide** (DIMROTH), A., i, 440.
- Carminone compounds** (LIEBERMANN and LANDAU), A., i, 545.
- Carnotite**, analysis of (FRITCHLE), A., ii, 200.
- Carob**. See Agricultural Chemistry.
- Carone**, physiological action of (RIMINI), A., ii, 522.
- Caro's acid** or **reagent**, composition and reaction of (BACH), A., ii, 14.
See also Persulphuric acids under Sulphur.
- Carpinic acid**, bromo-, attempts to prepare (JOWETT), T., 598; P., 1901, 57.
- Carrots**. See Agricultural Chemistry.
- Carvacrol**, action of bromine on, in presence of aluminium bromide (BODROUX), A., i, 697.
sodium derivative, action of ethyl chlorofumarate on (RUHEMANN), T., 919; P., 1901, 155.
- Carvacroxyfumaric acid** and its ethyl ester (RUHEMANN), T., 920; P., 1901, 155.
- 1-Carvacroxymethylbenzoxazole** (COHN), A., i, 752.
- 2-Carvacroxymethyl-5-ethoxybenzimidazole** and its picrate (COHN), A., i, 352.
- Carvacrylglycoside**, preparation of (RYAN and MILLS), T., 706; P., 1901, 90.
- Carvenone**, production of (BREDT, ROCHUSSEN, and MONHEIM), A., i, 218.
- Carvestrene**, ortho- and ψ - (SEMMLER), A., i, 331.
- Carvone**, auto-oxidation of (HARRIES), A., i, 551.
- Carvone**, estimation of, in ethereal oils (WALTHER), A., ii, 49.
- Carvotanacetone** and its derivatives (HARRIES), A., i, 551.
- Cascarilla oil**, constituents of (FENDLER), A., i, 219.
- Cascarillic acid** and its amide, bromide, and salts (FENDLER), A., i, 219.
- Casease**, production of, by a parasitic *Streptothrix* (BODIN and LENORMAND), A., i, 624.
- Casein**, action of nascent chlorine on (HABERMANN and EHRENFELD), A., i, 622.
hydrolysis of, by hydrochloric acid (FISCHER), A., i, 780.
as food (BACKHAUS and BRAUN), A., ii, 529.
paranucleic acid from (SALKOWSKI), A., i, 242, 434.
- Casein**, chloro-, and its decomposition products with fuming hydrochloric acid (PANZER), A., i, 780.
- Cassia flowers**, oil of (SCHIMMEL & Co.), A., i, 394.
- Castor oil**, distillation of (THOMS and FENDLER), A., i, 252.
- Catalase**, a new enzyme (LOEW), A., i, 435.
- Catalysis**. See under Affinity.
- Catechol** (*pyrocatechol*, 1:2-*dihydroxybenzene*), diethyl ether, 4-amino- and its acetyl derivatives, and 4-nitro- (WISINGER), A., i, 205.
methylene ether, *p*-amino-, and its hydrochloride and acetyl derivative (RUPE and v. MAJEWSKI), A., i, 104.
- Catechol**, chloro- (JACKSON and KOCH), A., i, 597.
- Catha edulis* (BEITTER), A., ii, 268.
- Cathode rays**. See Photochemistry.
- Cattle**. See Agricultural Chemistry.
- Cedar-nut oil** (v. SCHMOELLING), A., ii, 136.
- Celestite** from Marienstein, Bavaria (v. SUSTSCHINSKY), A., ii, 605.
from Ontario (HOFFMANN), A., ii, 319.
- Cellose** from cellulose and its acetyl derivative (SKRAUP and KÖNIG), A., i, 370.
- Cells**. See Electrochemistry.
- Cellulose** (TOLLENS), A., i, 453; (WOLFFENSTEIN and BUMCKE), A., i, 582.
cotton, mercerised, or precipitated, properties of (VIGNON), A., i, 16.
ketonic constitution of (FENTON and GOSTLING), T., 365; P., 1901, 22; (CROSS and BEVAN), T., 366; P., 1901, 22.
behaviour of, to nitrating agents, and mixed esters of (CROSS, BEVAN, and JENKS), A., i, 672.

- Cellulose**, sugars from (FENTON), P., 1901, 166.
 sodium, constitution of, and action of aqueous ammonia on (THIELE), A., i, 634.
 xanthates (CROSS and BEVAN), A., i, 452.
 estimation of, in plants (HOFFMEISTER), A., ii, 205.
- Celluloses**, nitro- (LUNGE and BEBIE), A., i, 508.
 comparison of, with nitromannitols (VIGNON and GERIN), A., i, 662.
 soluble, estimation of, in gun-cotton and smokeless powder (QUINAN), A., ii, 480.
- Cement**, Portland, action of sea water on (REBUFFAT), A., ii, 385.
- Cements**, hydraulic, constitution of (REBUFFAT), A., ii, 18.
- Cement testing** (KLEIN and PECKHAM), A., ii, 579.
- Cephalopods**, metabolism in (v. FÜRTH), A., ii, 115.
- Cerebrin**, galactose from (SCHULZ and DITTHORN), A., i, 554.
- Cerebron** and its bromo-derivative (WÖRNER and THIERFELDER), A., i, 176.
- Cerebro-spinal fluid**, oxydase in (CAVAZZANI), A., ii, 257.
- Cereic acid** (HEYL), A., i, 738.
- Cerite metals**, separation of, from monazite sand (MEYER and MARCKWALD), A., ii, 21.
 See also Earths, rare.
- Cerium**, thermochemistry of the hyperacids of (PISSARJEWSKY), A., ii, 56.
 double nitrates of quadrivalent (MEYER and JACOBY), A., ii, 510.
 nitrate, double salts, with ammonium nitrate (DROSSEBACH), A., ii, 102.
 nitride (MATIGNON), A., ii, 61.
 oxide, preparation of pure (STERBA), A., ii, 602.
 crystallised (STERBA), A., ii, 602.
- Ceruleite** from Huanaco, Chili (DUFET), A., ii, 64.
- Cetipic acid** (*oxalldiacetic acid*), ethyl ester, condensation of, with *o*-diamines (THOMAS-MAMERT and STRIEBEL), A., i, 614.
- Ceylon oil**. See Cocoa butter
- Chalcopyrite** (MORGAN and SMITH), A., ii, 319.
- Chalybite** from Roumania (PONI), A., ii, 26.
- Charcoal**, wood, action of sulphuric acid on (VERNEUIL), A., i, 546.
- iso***Chavibetol** (POMERANZ), A., i, 700.
- Cheese**, estimation of nitrogen in (VIVIAN), A., ii, 363.
- Cheese**. See also Agricultural Chemistry.
- Chelerythrine** and its salts (FISCHER), A., i, 742, 743; (WINTGEN), A., i, 744.
- Chelidonine** and its salts (SCHMIDT), A., i, 742; (WINTGEN), A., i, 743.
- Chelidonium majus*, alkaloids of (SCHMIDT), A., i, 742; (WINTGEN), A., i, 743.
- Chemical calculation**, short methods of (RICHARDS), A., ii, 648.
 combination, theory of (MARTIN), P., 1901, 169.
 constitution, relation between reactive power and (WEGSCHEIDER), A., ii, 229.
 of triphenylmethane colouring matters in relation to the absorption spectra of their aqueous solutions (LEMOULT; CAMICHEL), A., i, 100.
 and absorption spectra of saline solutions, action of heat on (HARTLEY), A., ii, 53.
 of liquids in relation to temperature and viscosity (BATSCHINSKI), A., ii, 645.
 and composition in relation to density; oxygenated compounds (KANONNIKOFF), A., ii, 305.
 relation between, and colour of isomerides of rosindulines (KEHRMANN), A., i, 52.
 relationship between, physiological action, and chemical change in the organism (HILDEBRANDT), A., ii, 614.
 of methylbenzaconine and of pyracontine in relation to their physiological action (CASH and DUNSTAN), A., ii, 612.
 relation between physiological action and, in the piperidine series (R. and E. WOLFFENSTEIN), A., ii, 566.
 energy of formic acid (CAZENEUVE), A., ii, 379.
 formulæ, agreement between, and the theory of invariants (GORDAN and ALEXÉEFF), A., ii, 13; (STUDY), A., ii, 497.
 kinetics, form of the laws of, for homogeneous systems (WEGSCHEIDER), A., ii, 57.
 mechanics, experimental verification of a law of (PÉLABON), A., ii, 545, 656.
 transformations, polymolecular, between ferric salts, chromic acid or nitrous acid and metallic iodides (SCHÜKAREFF), A., ii, 647.
- Chemistry**, contributions to (CLARKE), A., ii, 63.

Chemistry, inorganic and organic, remarks on the relation between (MICHAELIS), A., i, 195.
 physical, the study of (WINKLER), A., ii, 232.

Chicory root, analysis of (WOLFF), A., ii, 295.

Children, influence of boric acid and borax on metabolism in (TUNNICLIFFE and ROSENHEIM; GRÜNBAUM), A., ii, 517.
 influence of formaldehyde on metabolism in (TUNNICLIFFE and ROSENHEIM), A., ii, 517.
 See also Infants.

Chloral, action of alcohols on (GABUTTI), A., i, 367.

Chloral hydrate, molecular refraction of, in solution (RUDOLPHI), A., ii, 489.
 molecular weight of, at the boiling point (DE FORCRAND), A., i, 668.

Chloralaminophenylguanidine nitrate (PELLIZZARI and RONCAGLIOLI), A., i, 768.

Chlorine, evolution of, from the decomposition of chlorates (SODEAU), T., 247; P., 1900, 209.
 preparation of, from sodium chlorate (GRAEBE), A., ii, 309.
 solubility of, in aqueous hydrochloric acid (MELLOR), T., 225; P., 1900, 221.
 reaction of, with ammonia (NOYES and LYON), A., ii, 601.
 union of, with hydrogen (MELLOR), T., 216; P., 1900, 221.
 origin of combined, in moorland waters (ACKROYD), T., 673; P., 1901, 87.

Hydrochloric acid (*hydrogen chloride*), electrolysis of (MELLOR), T., 216; P., 1900, 221.
 heat of formation of (AKUNOFF), A., ii, 82.
 influence of cane sugar on the conductivity of solutions of (MARTIN and MASSON), T., 707; P., 1901, 91.
 depression of the freezing point in solutions containing sulphuric acid and (BARNES), A., ii, 304.
 dry, apparatus for the evolution of (GWIGGER), A., ii, 93.
 preparation of solutions of, for analysis (MEADE), A., ii, 530.
 reaction between ethyl alcohol and (PRICE), T., 303; P., 1900, 185.
 supposed compound of, with ether (JÜTTNER), A., ii, 595.
 and methyl ether, mixtures of (KUENEN), A., ii, 146.
 estimation of, in gastric juice (MEUNIER), A., ii, 342.

Chlorine:—

Chlorides, decomposition of, by ignition with organic matter (DAVIES), A., ii, 277.
 variation in the excretion of, during insufficient nutrition (JAVAL), A., ii, 565.

Chlorates, decomposition of (SODEAU), T., 247, 939; P., 1900, 209; 1901, 149.
 detection of, by strychnine (FAGES), A., ii, 191.
 iodometric estimation of, in electrolytic bleaching solutions and potassium chlorate lyes (DITZ), A., ii, 687.

Hypochlorous acid, action of, on metallic chlorides (v. TIESENHOLT), A., ii, 154; (FOERSTER), A., ii, 310.
 action of, on olefines (KRASSUSKY), A., i, 246.

Hypochlorites, transformation of, into chlorates (FOERSTER), A., ii, 309.
 behaviour of, with carbohydrates (BRÄUTIGAM), A., i, 671.

Perchloric acid, action of bromine and iodine on (MICHAEL and CONN), A., ii, 152.
 reactions of, with aspidospermine and the strychnine alkaloids (HAEUSSERMANN and SIGEL), A., ii, 124.

Chlorine peroxide and as a steriliser of drinking water (REYCHLER), A., ii, 548.
heptoxide, action of bromine and iodine on (MICHAEL and CONN), A., ii, 152.

Chlorine compounds, organic, in the urine (VILLE and MOTTESSIER), A., ii, 565.

Chlorine, estimation of:—
 estimation of, in benzyl and benzylidene chlorides (MACKENZIE), T., 1220.
 estimation of, in wines (KLEIBER), A., ii, 629.

Chloro-acids, fatty, formation of, from the corresponding amino-acids (JOCHER), A., i, 129.

Chlorocarbonates, preparation of (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 662, 663, 697.
 of alcohols (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 662, 663, 697.
 of phenols and their derivatives (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 697.
 action of lead thiocyanate on (DORAN), T., 906; P., 1901, 130.

- Chloroform** of crystallisation (KASSNER), A., i, 283.
 formation of, from lactic acid (EBERHARD), A., i, 357.
 vapour tensions of mixtures of ether and (KOHNSTAMM and VAN DALFSEN), A., ii, 641.
 action of chloroplatinic acid on (PRANDTL and HOFMANN), A., i, 13.
 condensation of, with cyanoacetamide (ERRERA), A., i, 43.
 reaction between potassium hydroxide and (SAUNDERS), A., ii, 13.
 physiological action of (WRIGHT), A., ii, 180, 408.
 action of, on the reducing power of blood (LAMBERT and GARNIER), A., ii, 257.
 precipitability of proteids by (SALKOWSKI), A., i, 241; (KRÜGER), A., i, 621.
- Chloroform water**, physiological action of (ROSTOKI), A., ii, 261.
- "Chloroformic dialysis"** (DASTRE), A., ii, 325.
- α -Chlorohydrin**, action of, on tertiary amines (BIENENTHAL), A., i, 128.
- Chloropal** from Moravia (V. JOHN), A., ii, 250.
- Chlorophosphines**, aromatic, and their derivatives (MICHAELIS), A., i, 300.
- Chlorophyll**. See Agricultural Chemistry.
- Chlorophyllin**, blue (TSVETT), A., i, 94.
Metachlorophyllins and **Metachlorophyllin- β** (TSVETT), A., i, 222.
- Chloroplatinic acid**. See under Platinum.
- Chocolate**, detection of dextrin and tragacanth in (WELMANS), A., ii, 288.
 detection of sesamé oil in (POSSETTO), A., ii, 703.
- Chocolate-flour**, analysis of (BEYTHIEN and HEMPEL), A., ii, 288.
- Chondrus crispus***, carbohydrates of (SEBOR), A., i, 15.
- Chromatophores**, action of enzymes on (KONING), A., i, 177.
- Chrome alum**, viscosity of solutions of (FERRERO), A., ii, 494.
- Chrome-steel**, analysis of (HERTING), A., ii, 284.
- Chromite** (*chromic iron ore*) from Kraubat, Upper Styria (RYBA), A., ii, 110.
 from North Carolina (PRATT), A., ii, 64.
- Chromium**, electrolytic deposition of (FÉRÉE), A., ii, 513.
 electrical properties of (LUTHER), A., ii, 301; (ABEL), A., ii, 490; (BRAUER), A., ii, 635.
- Chromium**, electromotive force and optical constants of (MICHELI), A., ii, 82.
- Chromium alloy** with aluminium, effect of various compounds on the periodicity of (OSTWALD), A., ii, 24.
- Chromium boride** (TUCKER and MOODY), P., 1901, 129.
- Chromic chloride**, anhydrous, rate of solution of, in presence of reducing agents (DRUCKER), A., ii, 230.
 hydrates of (WERNER and GUBSER), A., ii, 453; (PFEIFFER), A., ii, 659.
- Trichlorotriaquochromium**, existence of, and compound of, with pyridine hydrochloride (PFEIFFER), A., ii, 659.
- Chromium**, new oxide of, CrO (FÉRÉE), A., ii, 513.
 oxide, estimation of, volumetrically, in chromium oxide mordants (HARTMANN), A., ii, 626.
sesquioxide, new hydrate of, Cr₂O₃.H₂O (FÉRÉE), A., ii, 513.
 oxides and hydroxides (WYROUBOFF), A., i, 580.
- Chromic acid**, velocity of reaction and polymolecular transformations between, and metallic iodides (SCHÜKAREFF), A., ii, 647.
 use of diphenylcarbazine for detecting, in cotton dyed with chrome yellow (CAZENEUVE), A., ii, 626.
 estimation of (KEBLER), A., ii, 694.
 estimation of, iodometrically (SEUBERT and HENKE), A., ii, 132.
- Chromium nitride** (FÉRÉE), A., ii, 514.
- Chromium**, estimation of:—
 estimation of (NAMIAS), A., ii, 38.
 estimation of, by potassium-iodide-iodate mixture (STOCK and MASACIU), A., ii, 284.
 estimation of, in tungsten alloys (IBOTSON and BREARLEY), A., ii, 198.
- Chromogen**, new, producing a carmine-red dye (MOLISCH), A., ii, 571.
- Chromone group**, syntheses in the (v. KOSTANECKI and RÓZYCKI), A., i, 222; (v. KOSTANECKI and TAMBOR), A., i, 558.
- Chromyl dichloride**, use of, in destroying organic substances in toxicological analysis (PAGE), A., ii, 39.
- Chrysazinsulphonic acid**, *p*-diamino- (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 760.
- Chrysoidine-2-carboxylic acid**, methyl ester and its hydrochloride (MEHNER), A., i, 472.
- Chrysoin** (SISLEY), A., i, 775.

- Chrysophyll** (SCHUNCK), A., i, 734.
- Ciders**, new indicator for estimating the acidity of (RUNYAN), A., ii, 629.
- Cigar smoke** (HABERMANN), A., ii, 680.
See also Tobacco.
- Cincholeuponic acid**, conversion of, into an acid free from nitrogen (SKRAUP), A., i, 226.
- Cinchomeronic acid** (KIRPAL), A., i, 227.
- Cinchomeronic acid** (*pyridine-3:4-dicarboxylic acid*), methyl ester and chloride (MEYER), A., i, 750.
- Cinchona bark**, estimation of the amount of alkaloids in (VAN KETEL), A., ii, 362.
- Cinchonic acid** and its chloride and methyl ester (MEYER), A., i, 407.
- Cinchonidine dibromide** and its salts and dibromide hydrobromide perbromide (CHRISTENSEN), A., i, 482.
alkyl and chloro-carbonates (VEREINIGTE CHININFABRIKEN ZIMMER & Co.), A., i, 739.
- Cinchonidine**, α - and β -*dibromo*- (GALLMARD), A., i, 162.
- Cinchonine** (JUNGLEISCH and LÉGER), A., i, 338.
transformation of, by sulphuric acid (SKRAUP), A., i, 404.
conversion of the hydrogen haloid additive compounds of, into halogen-free bases (SKRAUP), A., i, 480.
dibromide and its *hydrobromide*, and *dibromide hydrobromide perbromide* and its mercury salt (CHRISTENSEN), A., i, 482.
- δ -Cinchonine** and its hydriodides, and nitroso- and hydrochloro-derivatives (LANGER), A., i, 404.
- alloCinchonine* and its hydriodides, sulphate, and phenylcarbinide derivative (HLAVNÍČKA), A., i, 404.
- tautoCinchonine* (LANGER), A., i, 403.
- Cinchotoxine**, formula of, and its nitroso-derivatives and their salts (v. MILLER and ROHDE), A., i, 95.
- Cineolic acid** and its isomeride (RUPE and RONUS), A., i, 578.
- r-Cineolic acid*, resolution of, into its optically active components (RUPE and RONUS), A., i, 119.
- d-Cineolic anhydride* (RUPE and RONUS), A., i, 119.
- Cinnamaldehyde**, condensation of, with methyl nonyl ketone (CARETTE), A., i, 367.
- Cinnamic acid** (*β -phenylacrylic acid*), detection of, in benzoic acid (JONISSEN), A., ii, 207, 291.
- Cinnamic acid**, amyl and menthyl esters and their dibromo-derivatives (COHEN and WHITELEY), T., 1307; P., 1900, 213.
ethyl ester, action of sodium on (MICHAEL), A., i, 125.
methyl ester, action of diazomethane on (v. PECHMANN and BURKARD), A., i, 167.
- Cinnamic acid**, α -cyano-, ethyl ester and its isomeride (BERTINI), A., i, 537.
o- and *p*-nitro-, methyl esters (WAHL), A., i, 664.
- Cinnamic methylamide** and *dibromo*- (ORTON), T., 1355; P., 1901, 200.
- alloCinnamic acid*, α -bromo-, condensation of (MANTHEY), A., i, 31.
- Cinnamylcadolylic acid** (ASTRUC and MURCO), A., i, 144.
- Cinnamylidenebarbituric acid** (CONRAD and REINBACH), A., i, 410.
- Cinnamylideneindene** (THIELE), A., i, 76.
- Cinnamylidene-2-methylsemicarbazone** (YOUNG and OATES), T., 666; P., 1901, 86.
- Cinnamylidenephénylglycolohydrazide** (CURTIUS and MÜLLER), A., i, 779.
- Cinogenic acid** and its salts (RUPE and RONUS), A., i, 578.
- Citraconic acid** (*propylenedicarboxylic acid*), ethyl ester, action of ethylmalonate, methylmalonate and ethylmalonate on (MICHAEL), A., i, 123.
esters, action of diazomethane on (v. PECHMANN and BURKARD), A., i, 168.
- Citral**, oxidation products of, in the organism, and some cyclic isomerides (HILDEBRANDT), A., ii, 181, 669.
an isomeride of (CHEMISCHE FABRIK GRIESHEIM-ELEKTRON), A., i, 731.
- β -cycloCitral* and its compound with semicarbazide (TIEMANN] and SCHMIDT), A., i, 158.
- cycloCitral*s, isomeric, formation and constitution of (TIEMANN and SCHMIDT), A., i, 157.
- Citralaminophenylguanidine nitrate** and pterate (PELLIZZARI and RICKARDS), A., i, 770.
- cycloCitralsemicarbazone* (SCHMIDT), A., i, 599.
- Citraptene** (*Icnon camphor*) (THEULIER), A., i, 218.
- Citric acid**, action of formaldehyde on (ALBERDA VAN EKENSTEIN), A., i, 120.
and tartaric acid, best tests for (PARIS), A., ii, 206.
detection of, in wine (SPICA), A., ii, 701.

- Citric acid**, salts, constitution of (SCHIAVON), A., i, 666.
 iron and iron ammonium salts (MARTINOTTI), A., i, 667.
 manganese salt (POWER), A., i, 667.
Citron, oil of (BURGESS), A., ii, 702.
Citronellaldehyde, constitution of (HARRIES and SCHAUWECKER), A., i, 730.
Citrophen (*citrotriphenetidine*), colour reaction of, with potassium permanganate (MAAS), A., ii, 210.
Claisen reaction, the (LAPWORTH), T., 1269; P., 1900, 109; 1901, 95.
Clay, estimation of, in soil (PAGNOUL), A., ii, 283.
Clays, proximate analysis of (JACKSON and RICH), A., ii, 198.
Clover. See Agricultural Chemistry.
Cloves, proximate analysis of (MCGILL), A., ii, 432.
Coal, estimation of arsenic in (SMITH and JENKS), A., ii, 476; (CHARMAN), A., ii, 690.
 estimation of sulphur in (PELLET), A., ii, 622.
 See also Fuels.
Coal tar, presence of homologous compounds in (STOERMER and BOES), A., i, 31.
 brown-, destructive distillation of (ROSENTHAL), A., i, 581.
Cobalt, action of ammonia on, at high temperatures (BEILBY and HENDERSON), T., 1251; P., 1901, 190.
Cobalt alloy with aluminium (BRUNCK), A., ii, 656.
Cobalt bases, number of ions in (WERNER and HERTZ), A., ii, 638.
Luteocobaltic chlorosulphate and chloroselenate, crystalline form of (KLOBB), A., ii, 103.
Cobalt salts, action of alcohols on (DITZ), A., ii, 222.
Cobalt arsenate, octohydrated (DUCRU), A., ii, 23.
 ammoniacal arsenates (DUCRU), A., ii, 23, 73, 243.
 chloride, compound of, with cupric oxide (MAILHE), A., ii, 601.
 iodate and its hydrates, solubility of (MEUSSER), A., ii, 555.
 iodide, double salt with mercuric iodide (DOBROSERDOFF), A., ii, 510.
 nitrate, temperature coefficient of susceptibility of solutions of (MOSLER), A., ii, 643.
 nitride (BEILBY and HENDERSON), T., 1251; P., 1901, 190.
 peroxide (BAYLEY), A., ii, 162.
 oxides (HÜTTNER), A., ii, 389.
Cobalt selenides (FONZES-DIACON), A., ii, 22.
 silicide, preparation and properties of (LEBEAU), A., ii, 242.
 sulphide (HERZ), A., ii, 513.
Cobalt organic compounds:—
Cobalt compounds with diethylenediamine, stereoisomeric (WERNER), A., i, 510, 512; (WERNER and HUMPHREY), A., i, 511; (WERNER and GERB), A., i, 512; (WERNER and HERTZ), A., ii, 638.
Cobalticyanic acid, compounds of, with alcohols, aldehydes, ethers and ketones (v. BAEYER and VILLIGER), A., i, 659.
Cobalt, detection, estimation, and separation of:—
 reactions of (DONATH), A., ii, 389.
 detection of (DITZ), A., ii, 223.
 Vogel's method for the detection of (TREADWELL and VOGT), A., ii, 284.
 estimation of, as phosphate (DAKIN), A., ii, 131.
 separation of, from copper (SÜDERBAUM), A., ii, 198.
 separation of, from nickel (ROSENHEIM and HULDSCHINSKY), A., ii, 533.
 separation of, electrolytically, from nickel (BALACHOWSKY), A., ii, 533.
 separation of, from zinc (TREADWELL and KRAMERS), A., ii, 281.
Coca, assay of (LAMAR), A., ii, 631.
Cocaine, decomposition of, in the organism (WIECHOWSKI), A., ii, 615.
 and its hydriodide periodide, estimation of (GARSE and COLLIE), T., 675; P., 1901, 89.
r-Cocaine, conversion of tropinone into (WILLSTÄTTER and BODE), A., i, 482.
Coccellinic acid from lichens (HESSE), A., i, 150.
Coccolite from Moravia (KOVÁŘ), A., ii, 605.
Cocoa, detection of dextrin and tragacanth in (WELMANS), A., ii, 238.
 and cocoa mixtures, estimation of fat in (WELMANS), A., ii, 47.
Cocoa butter (*cocoanut oil*, *Ceylon oil*), composition of (KLIMONT), A., i, 663.
 detection of, in butter (RANWEZ), A., ii, 702.
 detection of, in butter and margarine (INDEMANS), A., ii, 78.
Cocoanut. See Agricultural Chemistry.
Cochineal, detection of, in wine (BELLIER), A., ii, 210.

Cod, ichthulin and ichthulic acid from (LEVEENE), A., i, 433.

*iso***Codeine** and its methiodide, preparation of, and the action of sodium hydroxide on the methiodide (SCHRYVER and LEES), T., 574; P., 1901, 55.

Cerulein, constitution of, and its pentaacetate, and methyl and ethyl ethers (ORNDORFF and BREWER), A., i, 724.

Coffee of Grande Comore, composition of the (BERTRAND), A., ii, 185.
roasted, adulteration of, by adding water and borax (BERTARELLI), A., ii, 195.

Coke, estimation of arsenic in (SMITH and JENKS; ARCHBUTT and JACKSON), A., ii, 476; (CHAPMAN), A., ii, 690.

Colchicine, isolation and estimation of (PRESCOTT and GORDIN), A., ii, 5.
physiological significance of, in different *Colchicum* and *Merendera* (ALBO), A., ii, 679.

Colchicum. See Agricultural Chemistry.

Collidine, compounds of, with metallic salts (TOMBECK), A., i, 164.

Colloidal solutions, theory of (DONNAN), A., ii, 439.

properties of (POSTERNAK), A., ii, 231, 544, 648.

size of the particles present in (DE BRUYN), A., ii, 90.

Colloids, invisible liquid layers and surface tension of (QUINCKE), A., ii, 646.

Colostrum. See under Milk.

Colour, relation between, and constitution of isomerides of rosinduline (KEHRMANN), A., i, 52.

of iodine solutions (VAUBEL), A., ii, 446.

of ions (VAILLANT), A., ii, 595.

of minerals (v. KRAATZ-KOSCHLAU and WÖHLER), A., ii, 166; (WEINSCHEK), A., ii, 167.

of smoky quartz (v. KRAATZ-KOSCHLAU and WÖHLER), A., ii, 166; (KOENIGSBERGER), A., ii, 167.

of zircon (v. KRAATZ-KOSCHLAU and WÖHLER), A., ii, 166; (SPEZIA), A., ii, 167.

Colour changes of substituted anilines when mixed with various reagents (OECHSNER DE CONINCK), A., i, 80.

Colour shade, theory of (LIEBERMANN), A., ii, 263.

Colouring matters, new (GRIMAUZ and LEFÈVRE), A., i, 268.

acridine, preparation of (BADISCHE ANILIN- and SODA-FABRIK), A., i, 753.

of the *æsculetin* series (LIEBERMANN and WIEDERMANN), A., i, 736.

Colouring matters, azo-. See under Azo.

of beetroot, and its absorption spectrum (FORMÁNEK), A., ii, 35.

from benzazoles (KYM), A., i, 47.

of blood, absorption spectra of the (FORMÁNEK), A., ii, 711.

yellow, accompanying chlorophyll and their spectroscopic relations (SCHUNCK), A., i, 734.

from 3:3'-dichlorobenzidine and naphthionic acid (COHN), A., i, 166.

from *m*-dialkylaminoalkyloxybenzenes (GRIMAUZ), A., i, 269.

from the condensation of *m*-diethylaminohydroxybenzoylbenzoic acid and its chloro-derivatives with the sulphonic acids of the hydroxynaphthalenes (FARBWERKE VORM. MEISTER, LUCIUS, and BRÜNING), A., i, 734.

violet, from the action of chromic acid on diphenylcarbazide (CAZENEUVE), A., i, 655.

of the phenylanthracene series (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 729.

phenyldiphenylenemethane, synthesis of a (HALLER and GUYOT), A., i, 569.

from the balsam of *Picea vulgaris* (TSCHIRCH and BRÜNING), A., i, 92.

from the resin-balsam of *Pinus Pinaster* (TSCHIRCH and BRÜNING), A., i, 221.

carmine-red from *Schenkia blumenaviana* (MOLISCH), A., ii, 571.

sulphonated hydroxyazo-, and their salts (SISLEY), A., i, 775.

production of, from sodium tetrazoditolyldisulphonate and β -naphthylethylamine (SEYEWITZ and BLANC), A., i, 621.

yellow, from thiocyanates (PAWLEWSKI), A., i, 71; (GOLDBERG), A., i, 193; 516, 677.

blue, green, and red, from triphenylmethane (GRIMAUZ), A., i, 269.

from triphenylmethane, absorption spectra of (CAMICHEL and BAYRAC), A., i, 296.

of the triphenylmethane series, relation between their constitution and the absorption spectra of their aqueous solutions (LEMOULT; CAMICHEL), A., i, 100.

red, in urine after administration of pyramidone (JAFFÉ), A., ii, 672.

$C_{15}H_{10}O_6$, from the decomposition of robinin, and its sulphate and tetracetyl derivative (PERKIN), P., 1901, 87; (SCHMIDT), A., i, 602.

- Colouring matters**, $C_{15}H_{10}O_6$ of the flowers of *Delphinium Consolida*, and its hydriodide, sulphate, and tetracetyl derivative (PERKIN and WILKINSON), P., 1900, 182.
chemical theory of the behaviour of (SISLEY), A., i, 99.
new method of characterising (CAMICHEL and BAYRAC), A., ii, 297.
dissolved, action of enzymes on (KONING), A., i, 177.
for fats (MICHAELIS), A., i, 489.
foreign, detection of, in spirits (CRAMPTON and SIMONS), A., ii, 134.
- Colouring Matters.** See also :—
Anthophaein.
Apigenin.
Apiin.
Beetroot-red.
Bilifuscin.
Bilirubin.
Brazilein.
Brazilin.
Campheride.
Campherol.
Chlorophyll.
Chlorophyllin.
Chrysophyll.
Cochineal.
Gallotannin.
Hæmatin.
Hæmin.
Hæmatoxylin.
Hæmoglobin.
Indigo.
Lotoflavin.
Luteolin.
Mesoporphyrin.
Metachlorophyllins.
Methæmoglobin.
Orchil.
"Orchil red."
Oroxylin.
Osyritrin.
Oxyhæmoglobin.
Phylloeyanin.
Phytolacca.
Quercitrin.
Rhamnazin.
Rhamnetin.
Robinin.
Rutin.
Tecomnin.
Trimethylbrazilin.
Violaquercitrin.
- Colpoon compressum* (*Osyris compressa*), constituents of (PERKIN), P., 1901, 88.
- Combustion**, apparatus for the auto-regulation of (GANIKE), A., ii, 195.
in furnaces, phenomena of (BOUDOUARD), A., ii, 651.
of gases (TANATAI), A., ii, 13, 228.
- Combustion** of nitrogen (SALVADORI), A., ii, 95.
- Compressibility** of solutions (GUINCHANT), A., ii, 227.
- Conchite**, a new form of calcium carbonate (KELLY), A., ii, 168.
relation of, to aragonite (KELLY), A., ii, 168; (BRAUNS), A., ii, 395.
- Conductivity**, electrical. See Electrochemistry.
heat. See Thermochemistry.
- Conhydrine**, oxidation of (WILLSTÄTTER), A., i, 739.
- Conifer seeds.** See Agricultural Chemistry.
- Contact action**, theory of (EULER), A., ii, 495.
- Coolgardite** from Coolgardie, Western Australia (CARNOT), A., ii, 515; (RICKARD), A., ii, 663.
See also Tellurides.
- Cooling mixture**, preparation of (RUFF), A., ii, 17.
- Copal**, Kauri, from New Zealand (TSCHIRCH and NIEDERSTADT), A., i, 398.
- Copals**, acid and saponification numbers of some (LIPPERT and REISSIGER), A., ii, 50.
See also Resins.
- Copellidine** and *iso*Copellidine and their benzoyl, phenylcarbimide, and benzene-sulphonic derivatives (MARCUSE and WOLFFENSTEIN), A., i, 608.
- Copper**, presence and amount of, in plants (HECKEL), A., ii, 331.
electrolytic deposition of (DICKSON), A., ii, 159.
rate of electrolytic deposition of, in presence of sulphuric acid (SIEGRIST), A., ii, 370.
melting point of (HOLBORN and DAY), A., ii, 85.
equilibrium between the different stages of oxidation of (ABEL), A., ii, 377.
action of ammonia on, at high temperatures (BEILBY and HENDERSON), T., 1252; P., 1901, 190.
action of, on *Aspergillus niger* (RICHTER), A., ii, 567.
- Copper alloys**, slow alteration in, in contact with air and alkali chlorides (BERTHELOT), A., ii, 386.
with aluminium (BRUNCK), A., ii, 656.
with gold and silver, certain properties of (ROBERTS-AUSTEN and ROSE), A., ii, 25.
with tin, results of chilling (HEYCOCK and NEVILLE), A., ii, 508.
with tin and with zinc, density of (MAEY), A., ii, 655.

Copper alloys with zinc, thermo-chemistry of (BAKER), A., ii, 303.

Copper-ammonia sulphate, influence of temperature on the dissociation of (DAWSON and McCRAE), T., 1072; P., 1901, 178.

thiocyanate and its compound with ammonia (LITTELSCHIED), A., i, 635.

Copper antimonates (DELACROIX), A., ii, 316.

arsenides (KOENIG), A., ii, 108.

See also Algodonite, Domeykite, Mohawkite, and Stibio-domeykite. potassium and sodium carbonates (GRÖGER), A., ii, 240.

nitride (BEILBY and HENDERSON), T., 1253; P., 1901, 190.

oxide, commercial (DRAWE), A., ii, 508.

selenides (FONZES-DIACON), A., ii, 100.

sulphate, crystallisation of (HOPKINS), A., ii, 452.

chemical dissociation of, under the influence of water and temperature (HENGSEN), A., ii, 540.

solubility of mixtures of sodium sulphate and (MASSOL and MALDÈS), A., ii, 594.

mixtures of aqueous solutions of sulphuric acid and, composition of (LINDSAY), A., ii, 386.

effect of, on germination (DEHÉRAIN and DEMOUSSY), A., ii, 266; (COUPIN), A., ii, 335; (DEMOUSSY), A., ii, 570.

polysulphides (RÖSSING), A., ii, 100.

Cupric salts, compounds of, with organic bases (TOMBECK), A., i, 266.

fluoride, behaviour of, in solution (JAEGER), A., ii, 386.

hydroxide, solubility of, in salicylic acid (WOLFF), A., ii, 198.

action of, on solutions of metallic salts (MAILHE), A., ii, 601.

action of, on metallic sulphates (RECOURA), A., ii, 508; (SABATIER; ANDRÉ), A., ii, 509.

oxide, combined action of alkali salts and carbon dioxide on (KÜHLING), A., ii, 656.

Cuprous salts, action of, on hydrocarbons and on carbon monoxide (BERTHELOT), A., i, 493.

chloride, dissolved in potassium chloride, action of acetylene on (CHAVASTELON), A., i, 494.

iodide, specific gravity of (SPRING), A., ii, 451.

oxide, conversion of, into cupric oxide, without the use of asbestos filters (SOLTSIEN), A., ii, 286.

Copper organic compounds:—

and silver cyanides, estimation and separation of (BRUNCK), A., ii, 478. thiocyanate in analysis (VAN NAME), A., ii, 130.

Copper, estimation and separation of:— analysis of commercial (TRITCHOT), A., ii, 197; (HOLLARD), A., ii, 478.

estimation of, by organic bases (HERZ), A., ii, 478.

estimation of, volumetrically, as oxalate, and separation of, from arsenic, cadmium, tin, and zinc (PETERS), A., ii, 40.

estimation of, in pyrites (HEIDENREICH), A., ii, 197.

commercial, estimation of oxygen in (LUCAS), A., ii, 124.

separation of, from cobalt, from nickel, and from zinc (SÜDERBAUM), A., ii, 197.

electrolytic separation of mercury from (SPARE and SMITH), A., ii, 692.

Copper bars, sources of loss in the estimation of gold and silver in, and a method for its avoidance (VAN LIEW), A., ii, 41.

Copper materials, assay of, for gold and silver (GODSHALL), A., ii, 42.

Copper and silver nuggets, crystalline structure of (LIVERSIDGE), A., ii, 662.

Cordierite from Celebes and Germany (BÜCKING), A., ii, 64.

Coriamyrtin and **tutin**, comparison of the properties of (EASTERFIELD and ASTON), T., 125; P., 1900, 212.

Coriaria angustissima, *C. ruscifolia*, and *C. thymifolia* ("tutu"), constituents of (EASTERFIELD and ASTON), T., 120; P., 1900, 211.

Corn oil. See Maize oil.

Corundum, abrasive power of (EMERSON), A., ii, 61.

Corybulbine and the inactive variety (GADAMER and BRUNS), A., i, 288.

its formula, conversion of, into corydaline; its hydriodide and acetyl derivative (DOBBIE, LAUDER, and PALIATSEAS), T., 87; P., 1900, 205.

Corydaline, preparation of, from corybulbine, its formula, and ethyl sulphate, hydriodide and platinichloride (DOBBIE, LAUDER, and PALIATSEAS), T., 87; P., 1900, 205.

Cotarnine, formula of (HANTZSCH), A., i, 162.

Cotton seed oil, Halphen's reaction for (WRAMPMEYER), A., ii, 207; (SOLTSIEN), A., ii, 292, 430.

Coumalic acid, conversion of, into furan-2:4-dicarboxylic acid (FEIST), A., i, 557.

- iso*Coumalic acid and its amide (v. PECHMANN and HAUSER), A., i, 480.
- Coumalin-6-carboxylic acid** and its ethyl ester (LAPWORTH, T., 1280; P., 1901, 96.
- Coumaranone** (*ketcoumaran*), synthesis of, and its oxime and semicarbazone (STOERMER and BARTSCH), A., i, 94.
- p*-**Coumaric acid**, methyl ester (MEYER), A., i, 629.
- Coumarilic acid** and its derivatives (STOERMER and CALOV), A., i, 336.
- Coumarin-4-carboxylic acid** and its ethyl ester (v. PECHMANN and V. KRAFFT), A., i, 286.
- Coumarins** from phenol (v. PECHMANN and V. KRAFFT), A., i, 285.
from 1:2:4-trihydroxybenzene (v. PECHMANN and V. KRAFFT), A., i, 286.
- Coumarone** derivatives, nomenclature of (STOERMER), A., i, 400.
bromo-derivatives (SIMONIS), A., i, 335; (STOERMER and CALOV), A., i, 336.
- Coumarone-resins** (KRAEMER and SPILKER), A., i, 557.
- Coumarones**, homologous, presence of, in coal tar (STOERMER and BOES), A., i, 31.
- Cows**. See Agricultural Chemistry.
- Cream**, estimation of fat in (ECKLES), A., ii, 137; (DEHLHOLM), A., ii, 359.
- Cream of tartar**. See Tartaric acid, potassium hydrogen salt.
- Creatine**, conversion of, into creatinine by a soluble dehydrating ferment in the organism (GÉRARD), A., ii, 178.
- Creatinine**, reducing power of (GREGOR), A., ii, 67.
metabolism of (MACLEOD), A., ii, 115.
test for (CIPOLLINA), A., ii, 698.
- Cresol**, estimation of (RUSSIG and FORTMANN; DITZ), A., ii, 289.
- o*-**Cresol**, *tetrabromo*- (BODROUX), A., i, 697.
- m*-**Cresol**, estimation of, in cresol mixtures (DITZ), A., ii, 44.
- p*-**Cresol**, halogen derivatives, action of nitric acid on (ZINCKE), A., i, 330.
tri- and *tetra*-bromo-, and their ψ -quinols and acetyl derivatives (ZINCKE), A., i, 205.
3-iodo- (DIMROTH), A., i, 440.
- Cresols**, *dinitroamino*- (ZINCKE and DROST), A., i, 73.
- o*-**Cresolaldehyde**. See 2-Hydroxy-*m*-tolualdehyde.
- Cresoxy**-. See Tolyloxy-.
- m*-**Cresylglucoside**, preparation of (RYAN and MILLS), T., 705; P., 1901, 90.
- Critical** constants of argon, krypton, and xenon (RAMSAY and TRAVERS), A., ii, 238.
point of partially miscible liquids, remarkable phenomena near the (FRIEDLÄNDER), A., ii, 643.
state, the (KANONNIKOFF), A., ii, 438.
- Crocidolite** ("blue asbestos") from Griqualand West (OLDS), A., ii, 113.
- Croconic acid**, energy of (COFFETTI), A., i, 29.
- Crops**. See Agricultural Chemistry.
- Crotonaldehyde**, condensation of, with isobutaldehyde (PLATTENSTEINER), A., i, 254.
action of phenylhydrazine on (TRENER), A., i, 232.
- Crotonic acid**, ethyl ester, condensation of, with ethyl oxalate, and action of amyl formate and nitrite on (LAPWORTH, T., 1272; P., 1900, 109, 132.
action of sodium and of ethyl malonate and methylmalonate on (MICHAEL), A., i, 124.
- Crotonic acid**, amino-, ethyl ester, action of phosphoryl chloride on (MICHAELIS and V. AREND), A., i, 609.
- β -amino-, ethyl ester, and its isomeride (BEHREND, MEYER, and BUCHHOLZ), A., i, 136.
nitro-, ethyl ester (WAHL), A., i, 663.
- Crotonic acids**, stereoisomerism of (v. PECHMANN and BURKARD), A., i, 167.
- Crotonylanilide**, and the iso-compound, and β -chloro- and their phenylhydrazides (AUTENRIETH and SPIESS), A., i, 199.
- Crotonyl-benzylanilide** and -diphenylamide (BISCHOFF), A., i, 527.
- Crotonylene**. See Butinene.
- Crotonylthethylanilide** (BISCHOFF), A., i, 527.
- Crotonylthiocarbimide** from colza seeds (SJOLLEMA), A., i, 583.
- Cryoscopic** researches (CHRUSTSCHOFF), A., ii, 86, 373.
with methylene iodide (GARELLI and BASSANI), A., ii, 541.
- Cryoscopy**, phosphoryl chloride as a solvent in (ODDO), A., ii, 492.
of the bromides of antimony and arsenic (GARELLI and BASSANI), A., ii, 373.
of the human sweat (ARDIN-DELTEIL), A., ii, 67.
See also Freezing point.
- Crystalline liquids**, so-called (TAMMANN), A., ii, 231.
- Crystallisation** of difficultly crystallisable substances (RÜMLER), A., ii, 90.

Crystallisation of copper sulphate (HOPKINS), A., ii, 452.
of complex salt solutions (VAN'T HOFF), A., ii, 558.

Crystallography of double oxalates (WYROUBOFF), A., i, 7.
of double selenates, $R_2M(SeO_4)_2 \cdot 6H_2O$, M being magnesium (TUTTON), A., ii, 546.

Crystal-Ponceau (*Ponceau-GR*) (SISLEY), A., i, 775.

Crystals, method of obtaining, in a solution without formation of superficial crust (WRÓBLEWSKI), A., ii, 90.

study of growing, by instantaneous photomicrography (RICHARDS and ARCHIBALD), A., ii, 546.

mixed, vapour pressure of (HOLLMANN), A., ii, 436.

equilibrium of, with the vapour phase (ROOZEBOOM), A., ii, 151.

of mercuric iodide and silver iodide, formation of two kinds of (ROOZEBOOM), A., ii, 20.

of thallium iodide and nitrate, formation of (VAN ELJK), A., ii, 19.

Cumarophenazine (MARCHLEWSKI and SOSNOWSKI), A., i, 415.

Cumene (*isopropylbenzene*), oxidation of (BOEDTKER), A., i, 684.

ψ -Cumidine, acetylation of (SUDBOROUGH), T., 538; P., 1901, 45.

action of ethylene dibromide on (SENIER and GOODWIN), T., 254; P., 1900, 228.

Cuminaldehyde, action of, on α -picoline (BACKE), A., i, 562.

***p*-Cumyl chloromethyl ketone** (KUNCKELL and KORITZKY), A., i, 75.

Cumyl and ψ -Cumyl methyl ketones, selenium derivatives of (KUNCKELL and ZIMMERMANN), A., i, 215.

ψ -Cumyl-borobromide and -boroxide (MICHAELIS and RICHTER), A., i, 356.

Cupric and Cuprous. See under Copper.

Currents. See Electrochemistry.

Cuspidatic acid from lichens (HESSE), A., i, 149.

Cyanogen, spectrum of (BALY and SYERS), A., ii, 633.

Cyanogen bromide, action of, on dimethylaniline (SCHOLL and NÖRR), A., i, 376.

Hydrocyanic acid (*hydrogen cyanide*) in plants (SOAVE), A., ii, 332.

action of, on plants (JOHNSON), A., ii, 334.

poisoning, antidote for (HERTING), A., ii, 535.

Cyanogen:—

Cyanides, the *isopurpuric acid* reaction for (REICHARD), A., ii, 581.

*iso***Cyanides**, aliphatic, preparation of (KAUFLE and POMERANZ), A., ii, 634.

Cyanoic acid, potassium salt, absorption spectra of (HARTLEY, DOBBIE, and LAUDER), T., 855; P. 1901, 125.

estimation of (MELLOR), A., ii, 202; (HERTING), A., ii, 534; (VICTOR), A., ii, 623.

Cyanogen, estimation of:—

estimation of, in cyanides (MELLOR), A., ii, 202; (HERTING), A., ii, 534; (VICTOR), A., ii, 623.

estimation of, in gases (NAUSS), A., ii, 43.

Cyanophyceæ (BEYERINCK), A., ii, 523.

Cyanuric acid and chloride and methyl ester, absorption spectra of (HARTLEY, DOBBIE, and LAUDER), T., 849; P., 1901, 125.

Cyanurtriamide. See Melamine.

Cyclic motion, theory of, and the equation of condition (VAN DER WAALS), A., ii, 644.

Cymene, iodo- (EDINGER and GOLDBERG), A., i, 23.

***p*-Cymene**, 2-bromo- and 2-chloro-, from 1:1-bromonitro- and 1:1-chloronitro-camphane (FORSTER and ROBERTSON), T., 1003; P., 1901, 169.

Cumyl chloromethyl ketone (KUNCKELL and KORITZKY), A., i, 75.

Cystin and Cystein, isolation of, in the decomposition of proteids (EMDEN), A., i, 491.

Cystin, detection of, in waters (MOLINIÉ), A., ii, 42; (CAUSSE), A., ii, 133.

Cystinuria, the urine in (KOBERT), A., ii, 68.

Cytisine, and amino-, nitro-, and nitro-nitroso-, and the acetyl derivatives of the amino- and nitro-derivatives (FREUND and FRIEDMANN), A., i, 288.

Cytisinephenylthiocarbamide, nitro- (FREUND and FRIEDMANN), A., i, 288.

D.

Damascenine, isomeride of (POMMERHNE), A., i, 289.

Datura Stramonium grown in Egypt, amount of hyoscamine in (DUNSTAN and BROWN), T., 71; P., 1900, 207.

Day and hour of meeting, discussion on the, P., 1901, 20, 54, 117.

Decanaphthene, chloro- (MABERY and SIEPLEIN), A., i, 306.

- n-Decanedicarboxylic acid** and its salts (WALKER and LUMSDEN), T., 1197 ; P., 1901, 188.
electrosynthesis of (KOMPPA), A., i, 365.
- Decinoic acid.** See $\beta\zeta$ -Dimethyl- β -octadiene- θ -carboxylic acid.
- Decomposition voltages**, laboratory apparatus for (BANCROFT), A., ii, 302.
- Decyl alcohol** (*diethylamylcarbinol*) (MASSON), A., i, 250.
- Dehydroescorkein** (LIEBERMANN and WIEDERMANN), A., i, 736.
- Dehydromucic acid** and its derivatives (HILL; PHELPS and HALE), A., i, 555 ; (HILL and WHEELER), A., i, 556.
- Dehydrothymol**, *pentabromo*-, and its acetyl derivative and nitrate (V. BAEYER and SEIFFERT), A., i, 217.
- Delphinium *Consolida***, colouring matter of the flowers of (PERKIN and WILKINSON), P., 1900, 182.
- Denitrification.** See Agricultural Chemistry.
- Density** in relation to composition and chemical oxygen : oxygenated compounds (KANONNIKOFF), A., ii, 305.
maximum, molecular depression of the temperature of, of aqueous solutions of haloids of the alkali metals (DE COPPET), A., ii, 493.
of solutions of alcohol, ether, and water (BUSNIKOFF), A., i, 306.
of alloys (VAN AUBEL), A., ii, 453.
of copper with tin and zinc and of zinc with tin (MAEY), A., ii, 655.
of carbon dioxide in the solid and liquid state (BEHN), A., ii, 95.
of cuprous iodide (SPRING), A., ii, 451.
of ozone (LADENBURG), A., ii, 499.
of precipitates, method of determining the (THATCHER), A., ii, 685.
of aqueous sucrose solutions (DOMKE, HARTING, and PLATO), A., i, 189.
of tetramethylenecarbinol (PERKIN), T., 330 ; P., 1901, 33.
of uranium nitrate (OECHSNER DE CONINCK), A., ii, 164.
of uranium sulphate (OECHSNER DE CONINCK), A., ii, 660.
See also Vapour density.
- Deoxylizarin**, bromo-, and its methoxy derivative, and condensation with phenols (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 729.
- Deoxyanthrapurpurin**, bromo-, and its condensation with phenols (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 729.
- Deoxybenzoin**, action of dry silver oxide and ethyl iodide on (LANDER), P., 1901, 59.
- Deoxyflavopurpurin**, bromo- (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 729.
- Deoxyguanine** and **Deoxyxanthine** and their salts (TAFEL and ACH), A., i, 425.
- Deoxyheteroxanthine** and its salts (TAFEL and WEINSCHENK), A., i, 107.
- Dephlegmator**, Hempel's, distillation with (HIRSCHEL), A., ii, 87.
- Depolarisation.** See Electrochemistry.
- Desylene-methyl and -ethyl ethyl ketones** and their isomerides (JAPP and MELDRUM), T., 1031 ; P., 1901, 174.
- Detonating materials**, new (ALVISI), A., ii, 498.
- Deuteroalbumose.** See Albumose.
- Dextrin**, detection of, in cocoa and chocolate, and estimation of, by polarisation (WELMANS), A., ii, 288.
estimation of, in commercial glucose (LINDER), A., ii, 134 ; (MEUNIER), A., ii, 286.
- Dextrose** (*d-glucose*, *grape sugar*), and its glucosazone from cellulose (FENTON), P., 1901, 166.
in normal hen's blood (SAITO and KATSUYAMA), A., ii, 404.
constitution of (SIMON), A., i, 256.
birotation of (OSAKA), A., i, 127.
action of Bacteria on (HARDEN), T., 610 ; P., 1901, 57 ; A., ii, 567.
action of yeast maltase on (EMMERLING), A., i, 258 ; (HILL), A., i, 452.
digestibility of (DUCLERT and SÉNÉQUIER), A., ii, 458.
derivatives of (KOEING and KNORR), A., i, 369 ; (COLLEY), A., i, 671.
isomeric acetyl halogen derivatives of (FISCHER and ARMSTRONG), A., i, 257, 671.
influence of foreign substances on Trommer's test for (CIPOLLINA), A., ii, 698.
estimation of in commercial glucose (LINDER), A., ii, 134 ; (MEUNIER), A., ii, 286.
- Dextrophenylhydrazones** and their multirotation (SIMON and BÉNARD), A., i, 257.
- Dextrose-phenylureide** and -ureide (SCHOORL), A., i, 258.
- Diabetic coma**, pathology of (GRUBE), A., ii, 68.
- Diacetamide**, preparation of (TITHERLEY), T., 396, 411 ; P., 1901, 29, 31.
- Diaceticanthranilic acid.** See Anilidic-acetic-*o*-carboxylic acid.
- Diacetoneaminoxime** (HARRIES), A., i, 194.
and its dibenzoyl derivative (KOHN), A., i, 367.

- Diacetoxy-ethoxy- and -butoxy-pentanthrenes**, chloro- (BERTHEIM), A., i, 468.
- Diacetoxymethoxypentanthrene**, bromo- (LIEBERMANN and LANSER), A., i, 466.
- Diacetoxypentanthrene**, chloro-, and its ether (BERTHEIM), A., i, 468.
- β -2:4-Diacetoxyphenylmaleic anhydride** (v. PECHMANN and GRAEGER), A., i, 287.
- Diaceturia**, the urine in (KOBERT), A., ii, 68.
- Diacetyl-**. See also under the Parent Substance.
- Diacetylacetic acid**, ethyl ester, nitration of (BOUVEAULT and BONGERT), A., i, 501.
- Diacetyldiaminodi-bromo- and -chlorobenzene** (CHATTAWAY and ORTON), A., i, 228.
- Diacetyl-o-aminophenol**, nitration of (MELDOLA and WECHSLER), P., 1900, 180.
- 1:3-Diacetyldibromodiaminobenzene**, and 4:6-dibromo- (CHATTAWAY and ORTON), A., i, 228.
- o-Diacetyldi-bromo- and -chlorodiaminobenzene** (CHATTAWAY and ORTON), A., i, 228.
- Diacetylbromo-1:3-phenylenediamine**, 4:6-dibromo-, and **Diacetylbromo-p-phenylenediamine** (CHATTAWAY and ORTON), A., i, 228.
- m-Diacetyldichlorodiaminobenzene** and 4:6-dibromo- and 4:6-dichloro- (CHATTAWAY and ORTON), A., i, 228.
- p-Diacetyldichlorodiaminobenzene**, and 3:6-dichloro- (CHATTAWAY and ORTON), A., i, 228.
- Diacetyl-4-dimethylaminophenylazomethine** (SACHS and BARSHALL), A., i, 670.
- Diacetyldiphenyldihydrazone** (FAVREL), A., i, 167.
- Diacetylmethylaziminotoluene**. See 4-Acetylmethylamino-1-acetyl-7-methylbenzotriazole.
- Diacetylphenylenediamines**, bromo-amino- and chloro-amino-derivatives of (CHATTAWAY and ORTON), A., i, 227.
- $\beta\beta$ -Diacetylpropionic acid**, ethyl ester, action of semicarbazide and of hydroxylamine hydrochlorides on (MARCH), A., i, 312.
- Diacetyltartaric anhydride**, action of pyridine on (WOHL and OESTERLIN), A., i, 365.
- Dialkyl carbonates**, preparation of (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 663.
- m-Dialkylaminoalkyloxybenzenes**, colouring matters from (GRIMAU), A., i, 269.
- Dialkylaminoanthraquinones**, preparation and properties of (HALLER and GUYOT), A., i, 279.
- Dialkylamino-o-benzoyl- and -benzylbenzoic acids** and their derivatives (HALLER and GUYOT), A., i, 276, 279.
- $\beta\beta$ -Dialkylglutaric acids**, preparation of (GUARESCHI), A., i, 630.
- Di-p-allyloxyphenylcarbamide** (SPIEGEL and SABBATH), A., i, 534.
- isoDialuric acid**, condensation of, with thiocarbamide (v. VOGEL), A., i, 262.
- transformation of, into dialuric acid (KOECH), A., i, 262.
- Dialysis** in certain liquids in which indiarubber, but not parchment, swells (WRÓBLEWSKI), A., ii, 307.
- use of reed tubes for (PHILIPPSON), A., ii, 646.
- Diamines**, action of aldehyde and of carbonyl chloride on (SCHOLTZ and JAROSS), A., i, 485.
- aliphatic, regularities in the melting points of (KAUFLER), A., i, 259.
- aromatic, action of urethane on (MANUELLI and RECHT), A., i, 49.
- normal primary, alternation in boiling points in the series of (HENRY), A., i, 128.
- o-Diamines**, condensation of, with ethyl cetipate (THOMAS-MAMERT and STRIEBEL), A., i, 614.
- m-Diamines**, aromatic, thiosulphonic acids of (CLAYTON ANILINE Co.), A., i, 694.
- Diisamyl sulphate** (NEF), A., i, 627.
- Diisamylcarbinol** (*undecyl alcohol*) (GRIGNARD), A., i, 250, 680.
- Diisamylformal**, heat of combustion and of formation of (DELÉPINE), A., ii, 6.
- Diamyloxydiphenylmethane**, attempt to prepare (MACKENZIE), T., 1208.
- Di-p-amlyoxyphenylcarbamide** (SPIEGEL and SABBATH), A., i, 534.
- β -Diamylsulphonebutyric acid**, ethyl ester, and its α -mono- and di-methyl and -ethyl derivatives (POSNER), A., i, 704.
- γ -Diamylsulphonevaleric acid** and its barium salt and ethyl ester (POSNER and DEINHARDT), A., i, 704.
- 2:6-Dianilino-4:5-dimethylpyrimidine** (SCHLENKER), A., i, 764.
- 3:10-Dianilinodiphenylfluorindine** and its hydrochloride (KEHRMANN and GUGGENHEIM), A., i, 422.

- Dianisylidisazo- α -naphthol**, and the action of "Michler's hydrol" on (MÖHLAU and KEGEL), A., i, 57.
- Diastase** and rennin in pancreatic extracts (VERNON), A., ii, 710.
- exosmosis of, by young seedlings (LAURENT), A., ii, 69.
- commercial preparations of (BARTH), A., i, 437.
- and yeast, combined action of, on starch granules (MORRIS), T., 1085; P., 1901, 178.
- of the Amœba (MOUTON), A., i, 623.
- Diastases**, mechanism of the actions of (HARRIOT), A., ii, 175.
- Diazoacetic acid**, ethyl ester and potassium salt (HANTZSCH and LEHMANN), A., i, 678.
- new condensation of (BUCHNER and VAN DER HEIDE), A., i, 232.
- iso***Diazoacetic acid**, ethyl ester, and its potassium and sodium salts (HANTZSCH and LEHMANN), A., i, 678.
- Diazoaminobenzene-2-carboxylic acid**, *o*-, *m*-, and *p*-nitro- (MEHNER), A., i, 472.
- Diazoaminobenzene-2:2'-dicarboxylic acid**, methyl ester (MEHNER), A., i, 472.
- o*-**Diazoaminobenzoic acid** and its methyl ester, salts, and *m*- and *p*-nitro-ethyl ester (MEHNER), A., i, 471.
- ethyl ester (MEHNER), A., i, 645.
- Diazo benzene**, action of, on aliphatic aldehydes and ketones (BAMBERGER and MÜLLER), A., i, 778.
- action of, on phenol (BAMBERGER), A., i, 107.
- Diazo benzene phosphoroglucinol** methyl ether (PERKIN and ALLISON), P., 1900, 181.
- Diazo benzenesulphonic acid**, explosiveness of (WICHELHAUS), A., i, 241.
- action of hypochlorous acid on (ZINCKE), A., i, 778.
- 3-Diazocarbazole**, sensitiveness of, to light (RUFF and STEIN), A., i, 619.
- Diazo-chlorides**, action of methyl- and ethyl-acetylacetone on (FAVREL), A., i, 167.
- Diazo-compound**, $C_6H_5O_4N_2ClS$, and its isomeride, from *p*-chloroanilinesulphonic acids (PAAL), A., i, 693.
- Diazo-compounds**, sensitiveness of (RUFF and STEIN), A., i, 619; (GREEN, CROSS, and BEVAN), A., ii, 634.
- compounds of, with ethyl acetone-dicarboxylate, and their decomposition products (BÜLOW and HÖPFNER), A., i, 239.
- arylthiolsulphonates and arylsulphinates of (TRÖGER and EWERS), A., i, 171.
- 2-Diazo fluorene salts** and **2-Diazo fluorenone chloride** (DIELS), A., i, 522.
- Diazoguanidine**. See Carbaminoiminoazoinide.
- Diazomethane**, action of, on esters of crotonic, olefinemonocarboxylic, citraconic and mesaconic acids (v. PECHMANN and BURKARD), A., i, 167, 168.
- iso***Diazomethane**, derivatives of (HANTZSCH and LEHMANN), A., i, 678.
- Diazonium** (*benzenediazonium*) chlorides, action of ethereal alkylcyanoacetates on (FAVREL), A., i, 363.
- action of alkylmalonic acids on (FAVREL), A., i, 621.
- action of, on apiosedextrosephloroglucinol (VONGERICHTEN), A., i, 647.
- Diazotisation** of dinitro-*o*-anisidine (MELDOLA and EYRE), T., 1077; P., 1901, 131, 185.
- iso***Diazotisation** of arylamines (BAMBERGER and RÜST), A., i, 171.
- Diazotolueneimide**. See Tolueneazoinide.
- Diazoxide** from the action of a nitrite on dinitro-*o*-anisidine and its compound with β -naphthol (MELDOLA and EYRE), T., 1078; P., 1901, 132, 185.
- Dibenzamide**, preparation of (TITHERLEY), T., 395; P., 1901, 29.
- Dibenzamidinocarbamide**, *di-p*-nitro- (RAPPEPORT), A., i, 569.
- Dibenzenethiolsulphonic acid**, diazoaryl esters (TRÖGER and EWERS), A., i, 172.
- Dibenzenylazoxime**, *dinitro*- (BAMBERGER and SCHIEUTZ), A., i, 548.
- Dibenzoyl carbonate** (KNOLL & Co.), A., i, 703.
- Dibenzoyl ethylenedicarboxylic acid**, ethyl ester, *cis*- and *trans*-. See Dibenzoyl maleic and Dibenzoyl fumaric acids.
- s*-**Dibenzoyl ethylenes**, stereoisomeric, and their dibromides (PAAL and SCHULZE), A., i, 154.
- Dibenzoyl fumaric acid** (*trans-dibenzoyl ethylenedicarboxylic acid*), ethyl ester (PAAL and SCHULZE), A., i, 148.
- 2:5-Dibenzoyl furfuran** and its diphenylhydrazone and dioximes, and the action of nitric acid on (PHELPS and HALE), A., i, 555.
- Dibenzoyl homogentisic acid**, amide of (ORTON and GARROD), A., ii, 614.
- s*-**Dibenzoyl hydrazide** (AUTENRIETH and SPIESS), A., i, 230; (STOLLÉ), A., i, 316.
- Dibenzoyl maleic acid**, ethyl ester (*ethyl cis-dibenzoyl ethylenedicarboxylate*) (PAAL and SCHULZE), A., i, 148.

- α -Dibenzoylpropane and Dibenzoyldiphenylbutadiene**, reduction of (JAPP and MICHIE), T., 1010; P., 1901, 173.
- Dibenzoyltyrosinamide** (ORTON), T., 1355; P., 1901, 200.
- Dibenzyl, 2:2'-dinitro-** (LAPWORTH), T., 1275.
- Dibenzylacetonedicarboxylic acid**, and its ethyl ester (FICHTER and SCHIESS), A., i, 545.
- Dibenzylamine**, action of acetyl bromo- and acetylchloro-amino-2:4-dichlorobenzenes on (CHATTAWAY and ORTON), T., 464; P., 1901, 38.
- as*-Dibenzyleyanamide** (HANTZSCH and VAGR), A., i, 195.
- Dibenzylidinitrile**. See *s*-Diphenylethane, 4:4'-dicyano-.
- s*-Dibenzylhydrazine, di-*o*-chloro-**, and its diacetyl, dibenzoyl, and dinitroso-derivatives and picrate (CURTIUS and PAULI), A., i, 429.
- as*-Dibenzylhydrazine** (CURTIUS and FRANZEN), A., i, 293.
- Dibenzylideneacetone**, sulphonal derivatives of (POSNER), A., i, 474.
- Dibenzyl ketone**, condensation of, with benzil (HENDERSON and CORSTORPHINE), T., 1256; P., 1901, 190.
- β -Dibenzylmalamic acid** and its isomeride (LUTZ), A., i, 9.
- Dibenzylmethane** and its *di*- and *tetra*-nitro-, *oxy*-chlorophosphine-, *phosphinic* and *-phosphinamic* acids and their derivatives (MICHAELIS and FLEMMING), A., i, 438.
- Dibenzylphosphine derivatives** (MICHAELIS and CIANI), A., i, 301.
- β -Dibenzylsulphonebutyric acid**, ethyl ester, and its α -mono- and di-methyl and -ethyl derivatives (POSNER), A., i, 704.
- γ -Dibenzylsulphonevaleric acid** and its ethyl ester (POSNER and DEINHARDT), A., i, 703.
- Dibenzyltetrazone** (CURTIUS and FRANZEN), A., i, 293.
- Dibenzyl-*p*-toluidine, *m*-dinitro-** (PURGOTTI and MONTE), A., i, 22.
- Di-*tri*bromo-*m*-hydroxyphenyl dibromo-*o*-quinophenylene ether** (JACKSON and KOCH), A., i, 598.
- Diisobutylamine**, specific heat and latent heat of evaporation of (KAHLENBERG), A., ii, 492.
- thiobenzoate (WHEELER), A., i, 636.
- d-d*-Dibutylcarbamide** (GADAMER), A., i, 582.
- Diisobutylcarbinol (nonyl alcohol)** (GRIGNARD), A., i, 250.
- and its acetate, synthesis of (GRIGNARD), A., i, 679.
- 3:6-Dibutyl- and 3:6-Diisobutyl-2:5-diketopiperazine (leucinimide)** (FISCHER), A., i, 193.
- Diisobutyl diketoxime** (PONZIO), A., i, 452.
- Diisobutyloxydiphenylmethane** (MACKENZIE), T., 1207; P., 1901, 150.
- Dibutaryl**. See Dipropyl diketone.
- "Dibutarylacetoacetic acid, methyl ester"** (BOUVEAULT and BONGERT), A., i, 312.
- s-n*-Dibutarylhydrazide** (AUTENRIETH and SPIESS), A., i, 230; (STOLLÉ), A., i, 316.
- Dicarbanilinodi- ψ -cumylethylenediamine** (SENIER and GOODWIN), T., 260; P., 1900, 228.
- Dicarbanilinodiphenylethylenediamine (ethylenedicarbanilide)** (SENIER and GOODWIN), T., 259; P., 1900, 228.
- Dicarbanilinodi-*o*-, -*m*-, and -*p*-tolylethylenediamines** (SENIER and GOODWIN), T., 259; P., 1900, 228.
- Dicarbanilinodixylethylenediamine** (SENIER and GOODWIN), T., 260; P., 1900, 229.
- Dicarboxydimethyltrimethylenemalonic acid, ethyl ester** (PERKIN and THORPE), T., 763; P., 1900, 150; 1901, 111.
- Dicarboxydimethyltrimethylene-bromo- and -ethyl-malonic acids, ethyl esters** (PERKIN and THORPE), T., 769.
- Dicarboxyglutaconic acid**, and its ethyl esters, bimolecular (GUTHZEIT and WEISS), A., i, 314.
- Dicarbylamines, aromatic**, preparation of (KAUFLEDER), A., i, 462.
- Dicatecholcarbohydrazide** (EINHORN and ESCALES), A., i, 652.
- Dicinnamyltartaric acid, tetrabromo-** (COHEN and WHITELEY), T., 1308; P., 1900, 213.
- Dicoumarylketoxime** (STOERMER and CALOV), A., i, 336.
- Dicresotides, *o*-, *m*-, and *p*-** (EINHORN and PREIFFER), A., i, 712.
- Dicrotonic acid (β -methyl- α -ethylenecyclopentanecarboxylic acid)** and its esters, anhydride, and dibromide (v. PECHMANN), A., i, 63.
- Di- ψ -cumylethylenediamine** and its nitrate, mercurichloride and platinumchloride, and its dinitro-derivatives (SENIER and GOODWIN), T., 256; P., 1900, 228.
- action of phenylcarbimide on (SENIER and GOODWIN), T., 260; P., 1900, 228.
- Di- ψ -cumylphosphine derivatives** (MICHAELIS and HESS), A., i, 302.
- Di- ψ -cumylpiperazine** (SENIER and GOODWIN), T., 257; P., 1900, 228.

- Dicyclic compounds**, systematisation and nomenclature of (V. BAAYER), A., i, 135.
- Dielaidylthiocarbamide** (KRAFFT and TRITSCHLER), A., i, 116.
- Dielectric constants**. See *Electrochemistry*.
- Dietary studies** (GRINDLEY, SAMMIS, LADD, BEVIER, and SPRAGUE), A., ii, 518.
- 2:4-Diethoxybenzoylmethylacetone** (V. KOSTANECKI and LLOYD), A., i, 736.
- Diethoxybenzoylpyruvic acids**, 2:4- and 2:5-, ethyl esters (V. KOSTANECKI, PAUL, and TAMBOR), A., i, 735.
- Diethoxybenzylidene** (MACKENZIE), T., 1213; P., 1901, 150.
- Diethoxycarbinone**, dibromo- (LIEBERMANN and LANDAU), A., i, 546.
- Diethylacetal**, heat of combustion and of formation of (DELÉPINE), A., ii, 6.
- $\alpha\alpha$ -Diethylacetonedicarboxylic acid**, ethyl ester (CONRAD), A., i, 66.
- Diethylaminoanthraquinone** (HALLER and GUYOT), A., i, 279.
- Diethylamino-benzoyl- and -benzyl-tetrachlorobenzoic acids**, and the acetate, anhydride, and esters of the benzoyl derivative (HALLER and UMBROGROVE), A., i, 469.
- 3-Diethylamino-5:6:7:8-tetrachloro-anthraquinone** (HALLER and UMBROGROVE), A., i, 644.
- Diethylamino-dihydroxyanthraquinone and -hydroxyanthraquinonesulphonic acid** (HALLER and GUYOT), A., i, 279.
- Diethylamino-*m*-hydroxy-benzoyl- and -benzyl-tetrachlorobenzoic acids** (HALLER and UMBROGROVE), A., i, 644.
- m*-Diethylaminohydroxybenzoylbenzoic acid** and its di- and tetra-chloro-derivatives, colouring matters from when condensed with the sulphonic acids of the hydroxynaphthalenes (FARBWERKEVORM. MEISTER, LUCIUS, and BRÜNING), A., i, 734.
- Diethylamino-*m*-hydroxybenzylbenzoic acid** (HALLER and GUYOT), A., i, 276.
- 4-Diethylaminophenyl- μ -cyanoazomethine-4'-nitrophenyl hydrochloride** (SACHS and BRY), A., i, 229.
- Diethylaminophenylglyoxylic acid** (BOHRINGER & SONS), A., i, 713.
- Diethylamylcarbinol** (*decyl alcohol*) (MASSON), A., i, 250.
- $\alpha\beta$ -Diethylanhydracetonebenzil** (JAPP and MELDRUM), T., 1041; P., 1901, 176.
- Diethylarsine**, compounds of, with mercury salts (BIGINELLI), A., i, 20. detection of (GOSIO), A., ii, 193.
- Diethylisobutylcarbinol** (*nonyl alcohol*) (MASSON), A., i, 249.
- Diethyl diketone** and its dioxime (PONZIO), A., i, 452.
- 3:6-Diethyl-2:5-diketopiperazine** (FISCHER), A., i, 193.
- Diethyldisulphone-diphenylmethane and - α -phenylethane** (POSNER), A., i, 88.
- Diethyleneanisole**, tetrachloro- (KUNCKELL and ERAS), A., i, 75.
- Diethylenediaminecobalt salts**, dichloro-, stereoisomeric (WERNER), A., i, 510.
- 1:2-chloronitrito- (WERNER and GERB), A., i, 512.
- 1:6-chloronitrito- (WERNER), A., i, 512.
- dinitrito-, stereoisomeric (WERNER and HUMPHREY), A., i, 511.
- Diethylformal**, heat of combustion and of formation of (DELÉPINE), A., ii, 6.
- $\beta\beta$ -Diethylglutaric acid** (*heptanedicarboxylic acid*) (GUARESCHI and PEANO), A., i, 631.
- Diethylhexamethylenediurethane** and its carbamide (CURTIUS and CLEMM), A., i, 69.
- Diethyl ketone**, bromo-derivatives of (PAULY), A., i, 505.
- Diethyloctomethylenediurethane** and its carbamide (CURTIUS and STELLER), A., i, 70.
- Diethyloctylcarbinol** (*tridecyl alcohol*) (MASSON), A., i, 250.
- β -Diethylsulphone- α -dimethyl- and - α -diethyl-butyric acids**, ethyl esters (POSNER and EBERS), A., i, 705.
- $\beta\beta$ -Diethylsulphone- γ - and - δ -methylpentane- δ - and - γ -ones** (POSNER), A., i, 15.
- $\beta\beta$ -Diethylsulphonepentane- γ -one** (POSNER), A., i, 15.
- $\alpha\alpha$ -Diethylthiol- α -phenylethane** (POSNER), A., i, 88.
- 4:4-Diethyltrimethylenedicarbonimide**, 3:5-diacyano- (PEANO), A., i, 347.
- Diethyltrimethyleneurethane** (CURTIUS and CLEMM), A., i, 69.
- DIFFUSION** :—
- Diffusion of gold** in solid lead at the ordinary temperature (ROBERTS-AUSTEN), A., ii, 9.
- of hydrogen through palladium (WINKELMANN), A., ii, 646.
- Diffusion coefficients**, method of determining (BRUNER and TOLLOCZKO), A., ii, 11.
- Osmosis of liquids** across animal membranes (FLUSIN), A., ii, 148.
- across a membrane of copper ferrocyanide (FLUSIN), A., ii, 439.

DIFFUSION:—

- Osmosis** in marine invertebrates (QUINTON), A., ii, 116.
- Osmotic measurements**, the "myriotone" as unit in (ERRERA), A., ii, 375.
- membranes, preparation of, by electrolysis (MORSE and HORN), A., ii, 543.
- Osmotic pressure** and electromotive force (LEHFELDT), A., ii, 4, 5; (KRÜGER), A., ii, 145.
- exact relation between vapour pressure and (NOYES), A., ii, 87; (DIETERICI), A., ii, 439.
- extent to which the interaction of ionic charges diminishes (v. TÜRIN), A., ii, 375.
- effect of, on the form and structure of plants (BEAUVÉRIE), A., ii, 183.
- of complex solutions (JAKOWKIN), A., ii, 87.
- of dog's saliva (NOLF), A., ii, 176.
- Diformazyl phenyl ketone**, *di-m*-nitro- (BAMBERGER and SCHMIDT), A., i, 556.
- Difurfuryldicarbinylsuccinic acid** (FICHTER and SCHEUERMANN), A., i, 479.
- Difurfurylethanedialdehyde** and its oxidation and the action of phenylhydrazine and of hydroxylamine on (FENTON and GOSTLING), T., 812; P., 1901, 119.
- Difurfurylethanedicarboxylic acid** and its barium salt (FENTON and GOSTLING), T., 814; P., 1901, 119.
- $\alpha\beta$ -Difurfurylideneisopropionic acid** and **Difurfurylidenesuccinic acids** and their salts (FICHTER and SCHEUERMANN), A., i, 479.
- Digestibility** of butter and its substitutes (WIBBENS and HUIZENGA), A., ii, 253.
- of dextrose (DUCLERT and SÉNÉQUIER), A., ii, 458.
- Digestion**, influence of, on animal heat (REICHERT), A., ii, 28.
- of food by man (ATWATER and BENEDICT), A., ii, 253.
- cellulose, in the alimentary canal (MÜLLER), A., ii, 252.
- gastric, in Elasmobranchs (WEINLAND), A., ii, 458.
- in selachian fishes (WEINLAND), A., ii, 252.
- action of "saccharin" on (CHASSEVANT), A., ii, 323.
- peptic (MALFATTI), A., ii, 67.
- proteid, theory of (SAWJALOFF), A., ii, 403.
- salivary, of carbohydrates in the stomach (HENSLEY), A., ii, 666.

- Digestion** and metabolism in Echinoderms (COHNHEIM), A., ii, 668.
- in the small intestine (KUTSCHER and SEEMANN), A., ii, 667.
- in the ascidia of *Nepenthes* (CLAUTRIAU), A., ii, 183.
- See also Gastric juice and Stomach.
- Digestive power** of gastric juice (FROUX), A., ii, 561.
- Digitonin**, amorphous and crystalline (CLOETTA), A., i, 478.
- Digitoxin**, toxicological detection of (VITALI), A., ii, 50.
- Diglycerylcarbamide** (CURTIUS and HESSE), A., i, 71.
- Diguanides**, α -disubstituted (CRAMER), A., i, 771.
- β -Diheptioic acid** (GUERBET), A., i, 183.
- β -Diheptyl alcohol** (GUERBET), A., i, 182.
- Dihydroæsculetinsulphonic acid** and its sodium salt (LIEBERMANN and WIEDERMANN), A., i, 736.
- Dihydroisovalantolic acid**, and amide, and **Dihydroisovalantolactone** (SPRINZ), A., i, 325.
- Dihydroanthracene**, refraction and dispersion of (PELLINI), A., ii, 365.
- Dihydroanthraphenone** (LIPPMANN and KEPPICH), A., i, 37.
- r*-Dihydro- α -campholytic acid** and **Dihydro-*i*- α -campholytic acid**, α -bromo- (NOYES and BLANCHARD), A., i, 664.
- Dihydrocarveolacetic acid** and its ethyl ester (WALLACH and SPERANSKI), A., i, 156.
- Dihydrocollidinedicarboxylic acid**, ethyl ester, Hantzsch's synthesis of (RABE and BILLMANN), A., i, 164.
- Dihydrofurfuran-2:5-dicarboxylic acids**, α -, β -, and γ -, and their dibromides (HILL), A., i, 555; (HILL and WHEELER), A., i, 556.
- Dihydroindigotin** (VAUBEL), A., i, 715.
- Dihydroisindole** (*o*-xylylenimine), and its 5-amino- and 5-nitro-, and their salts, and its benzoyl and thiocarbamide derivatives (FRÄNKEL), A., i, 44.
- Dihydroinfracampholenic acid**, *di*- and *tri*-bromo- (FORSTER), T., 114; P., 1900, 211.
- Dihydroauronic acid**, amino-, nitrile, hydrochloride and picrate of (TIEMANN and TIGGES), A., i, 19.
- di*bromo-** (TIEMANN, KERSCHBAUM, and TIGGES), A., i, 7.
- Dihydromyrcene** and **cycloDihydromyrcene** and their derivatives (SEMMLER), A., i, 732.
- Dihydronaphthalene**, refraction and dispersion of (PELLINI), A., ii, 365.
- Dihydrophenanthrene oxide**, nitro- (SCHMIDT), A., i, 76.

- Dihydrotetrazines** (*bisdiazomethane*) (HANTZSCH and LEHMANN), A., i, 678.
- Dihydrotoluene** (*methylcyclohexadiene*) (HARRIES), A., i, 194.
- Dihydrotruxone** (MANTHEY), A., i, 31.
- Dihydroxyalkyloxypentanthrenes**, chloro- (BERTHEIM), A., i, 467.
- Dihydroxyanhydro-2:4-dimethyl-1:4-benzopyranols**, 5:7- and 7:8-, and their acetyl derivatives, hydrochlorides, and picrates (BÜLOW and WAGNER), A., i, 401.
- Dihydroxyanthraquinonesulphonic acid**, diamino- (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 760.
- 3:4-Dihydroxybenzoic acid**. See Protocatechuic acid.
- mp-Dihydroxybenzylideneindanone** (FEUERSTEIN), A., i, 279.
- Dihydroxyapocamphoric acid** (KOMPPA), A., i, 668.
- o-Dihydroxycatechol ether**, hexabromo- (JACKSON and KOCH), A., i, 598.
- Dihydroxydiethyl-*n*- and -*iso*-butylamines** and -propylamines, -isoamylamine, -heptylamine and -hexylamine and their salts and picrolonates (MATTHES), A., i, 260.
- Dihydroxydihydrocampholytic acid**, $C_9H_{16}O_4$, and its isomeride (TIEMANN, KERSCHBAUM, and TIGGES), A., i, 6.
- Dihydroxydihydrocitronellaldimethylacetal**, and its mono- and di-aldehyde and ketoaldehyde (HARRIES and SCHAUWECKER), A., i, 730.
- Dihydroxydihydrocyclogeranic acid** and its ethyl ester (TIEMANN and TIGGES), A., i, 158.
- Dihydroxydihydrolauronic acid** (TIEMANN, KERSCHBAUM, and TIGGES), A., i, 7.
- Dihydroxydihydromesityl oxide**. See Trimethyltriase.
- 2:8-Dihydroxy-3:7-dimethylacridine** (CASSELLA & Co.), A., i, 752.
- $\alpha\alpha$ -Dihydroxy- $\beta\beta$ -dimethylglutaric acid** and its salts, and condensation of, with *o*-tolylenediamine (PERKIN and THORPE), T., 757; P., 1901, 113; (PERKIN, THORPE, and WALKER), T., 781.
lactone of (PERKIN and THORPE), T., 756; P., 1901, 112.
- $\alpha\gamma$ -Dihydroxy- $\beta\beta$ -dimethylpropane** (WESSELY), A., i, 256.
- 8:8'-Dihydroxy-2:2'-dinaphthylamine-6:6'-disulphonic acid** (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 696.
- 2:2'-Dihydroxydiphenyl** and its diacetyl derivative (KRAEMER and WEISSGERBER), A., i, 535.
- p*-Dihydroxydiphenyl-4:6-dinitro-1:3-phenylenediamine** and its dicarboxylic and disulphonic acids (BADISCHE ANILIN- and SODA-FABRIK), A., i, 755.
- o*-Dihydroxydiphenylsulphone** (JACKSON and KOCH), A., i, 597.
- Dihydroxyfluorescein** and its tetracetyl derivative (LIEBERMANN), A., i, 595.
constitution of, and its triacetyl and tetrabenzoyl derivatives (FEUERSTEIN and DUTOIT), A., i, 723.
ammonium salt and dibromo- (THIELE and JAEGER), A., i, 723.
- Dihydroxymethoxybenzoic acid** (*phloroglucinolcarborylic acid*, *methyl ether*) and its methyl ester (HERZIG and WENZEL), A., i, 473.
- 1:5-Dihydroxy-3-methoxyxylene** hydrochloride, 4-amino-, and its tetracetyl derivative (BOSSE), A., i, 207.
- s-Dihydroxyoxamide** and its diacetate (PICKARD and CARTER), T., 846; P., 1901, 123.
- 2:3-Dihydroxycyclopentane**, *cis*- and *trans*-1:4-dibromo-, and their *di-p*-nitrobenzoyl derivatives (THIELE), A., i, 181.
- Dihydroxypentanthrene**, halogen derivatives of (LIEBERMANN and LANSEK), A., i, 466; (BERTHEIM), A., i, 468.
- Dihydroxy-2-phenylanhydro-4-methyl-1:4-benzopyranols**, 5:7- and 7:8-, and their salts, acetyl derivatives, and anhydro-bases (BÜLOW and WAGNER), A., i, 560.
- o*-Dihydroxyphenylhydroxy-*o*-quinone** and its tribenzoyl derivative, and the action of phenylhydrazine on (JACKSON and KOCH), A., i, 597.
- β -2:4-Dihydroxyphenylmaleic acid** (v. PECHMANN and GRAEGER), A., i, 287.
- Dihydroxypivalic acid**. See Methyl-dimethylolacetic acid.
- 2:6-Dihydroxy-4-isopropyl-dihydroresorcinol**. See 2:6-Diketo-4-isopropyl-hexamethylene.
- $\gamma\delta$ -Dihydroxypropylmalonamide** (TRAUBE and LEHMANN), A., i, 502.
- 2:6-Dihydroxypyridine**, 3:5-dicyano-, and 2:6-Dihydroxypyridine-3-carboxylamide, 5-cyano-, ammonium derivatives of (ERRERA), A., i, 43.
- 2:6-Dihydroxypyridine-3:5-dicarboxylamide** (ERRERA), A., i, 43.
- 2:4-Dihydroxyquinoline**, preparation of (BADISCHE ANILIN- and SODA-FABRIK), A., i, 751.
- Dihydroxyquinone**, bromo-, and its oxime, phenylhydrazone, and diacetyl derivative (MANUELLI), A., i, 216.

- Dihydroxystearic acid**, preparation, melting point, and calcium salt of, and the action of fused potash on (LE SUEUR), T., 1315; P., 1901, 91.
- Dihydroxytartaric acid**, combination of, with 6-chloro-2:3-tolylenediamine (COHN), A., i, 637.
- 4:4'-Dihydroxytetraphenylmethane** and its diacetyl compound (MACKENZIE), T., 1209; P., 1901, 150.
- 2:6-Dihydroxy-3:4:4-trimethyldihydroresorcinol**. See 2:6-Diketo-3:4:4-trimethylhexamethylene.
- Dihydroxytriphenylmethane** and its diacetyl derivative (MACKENZIE), T., 1216.
- Dihydroxytrimethoxycarminonecarboxylic acid**, methyl ester (LIEBERMANN and LANDAU), A., i, 545.
- 2:5-Dihydroxy-1:3-xylene** (BAMBERGER and RISING), A., i, 531.
- 4- α -Diketobutylpyridine**. See 4-Acetoacetylpyridine.
- Diketoapocamphoric acid**, methyl and ethyl esters (KOMPPA), A., i, 668.
- Diketodihydropentanthrenedicarboxylic acid**, bromo-, ethyl ester (LIEBERMANN and LANSER), A., i, 466.
- p*-**Diketo**hexamethylene, acetals of (STOLLE), A., i, 390.
- Diketo**hydrindene. See Indanedione.
- Diketo**hydrindenecarboxylic acid, bromo- and chloro-, ethyl esters (FLATOW), A., i, 543.
- Diketones**, mercaptols from (POSNER), A., i, 14; (TARBOURIECH), A., i, 329.
- α -Diketones**, preparation of (PONZIO), A., i, 577.
- conversion of $\alpha\beta$ -unsaturated diketones into (PAULY and V. BERG), A., i, 506.
- combination of, with phenylhydrazine (PETRENKO-KRITSCHENKO and LORDKIPANIDZE), A., i, 505; (PETRENKO-KRITSCHENKO and ELTSCHANINOFF), A., i, 506.
- β -Diketones**, synthesis of (MOUREU and DELANGE), A., i, 352.
- 1:2-Diketo**cyclopentane phenylhydrazine (DIECKMANN), A., i, 540.
- 4- α -Diketo- γ -phenylpropylpyridine**. See 4-Benzoylacetylpyridine.
- 2:6-Diketo-4-isopropylhexamethylene** and its dioxime and 3-carboxylic acid, ethyl ester (CROSSLEY), P., 1901, 172.
- 2:6-Diketo-3:4:4-trimethylhexamethylene** (2:6-dihydroxy-3:4:4-trimethyldihydroresorcinol), and its silver salt, dioxime, and ethyl ester, and action of bromine, phosphorus pentachloride and sodium hypobromite on (CROSSLEY), T., 141; P., 1900, 90.
- 2:6-Diketo-3:4:4-trimethylhexamethylene** (2:6-dihydroxy-3:4:4-trimethyldihydroresorcinol), 1-mono- and 1:1-di-bromo- (CROSSLEY), T., 145; P., 1900, 91.
- 2:6-Diketo-3:4:4-trimethylhexamethylene-3-carboxylic acid**, ethyl ester and its hydrolysis (CROSSLEY), T., 141; P., 1900, 90.
- Diketo**valerolactone- γ -carboxylic acid, β -phenylhydrazine (WOLFF and HEROLD), A., i, 503.
- Dilichenostearic acid** and its salts (HESSE), A., i, 87.
- Dimenthyl** and its isomeride (KURSANOFF), A., i, 553.
- Dimenthylmethylal** (WEDEKIND), A., i, 393.
- 1:3-Dimethoxybenzene**, 4-nitro- (FREYSS), A., i, 321.
- o*-**Dimethoxybenzoin** and its methyl ether, preparation of (IRVINE), T., 671; P., 1901, 88.
- Dimethoxybenzylidene** (MACKENZIE), T., 1212; P., 1901, 150.
- 2:6-Dimethoxy-4:5-dimethylpyrimidine** (SCHLENKER), A., i, 764.
- Dimethoxydiphenyldihydrazonecyanoacetic acid**, ethyl ester (LAX), A., i, 231.
- Dimethoxydiphenylmethane**, action of nitric acid on (MACKENZIE), T., 1211; P., 1901, 150.
- 5:7-Dimethoxy-2'-ethoxyflavone** (V. KOSTANECKI and WEBEL), A., i, 479.
- 5:7-Dimethoxy-3'-ethoxyflavone** (V. KOSTANECKI and STEUERMANN), A., i, 223.
- 6:7-Dimethoxy-3-methyl-coumarilic acid** and -coumarone (V. PECHMANN and HANKE), A., i, 211.
- 5:7-Dimethoxy-3:4'-methylenedioxyflavone** (V. KOSTANECKI, RÓŻYCKI, and TAMBOR), A., i, 92.
- d*-**Dimethoxysuccinic acid** and its esters, salts, and amide (PURDIE and IRVINE), T., 957; P., 1901, 157.
- esters, influence of solvents on the rotation of (PURDIE and BARBOUR), T., 971; P., 1901, 158.
- Dimethyl peroxide** (V. BAEYER and VILLIGER), A., i, 309.
- phenyliminothiolcarbonate (WHEELER and DUSTIN), A., i, 25.
- sulphate, preparation of (BLACKLER), A., i, 577.
- Dimethylacetal**, heat of combustion and of formation of (DELÉPINE), A., ii, 6.
- $\alpha\alpha'$ -Dimethylacetonedicarboxylic acid**, triethyl ester (V. PECHMANN), A., i, 64.

- Dimethylacetylacetonitrile (VAN REY-MENANT), A., i, 126.
- Dimethylacetylene. See Butinene.
- $\beta\beta$ -Dimethylacryl-benzylanilide and -diphenylamide (BISCHOFF), A., i, 527.
- Dimethylacrylic acid. See Pentenoic acid.
- $\beta\beta$ -Dimethylacryl-methyl and -ethyl-anilides (BISCHOFF), A., i, 527.
- $\alpha\alpha'$ -Dimethyladipic acids (*hexanedicarboxylic acids*), synthesis of (MOHR), A., i, 364.
- $\beta\beta$ -Dimethyladipic acid (*hexanedicarboxylic acid*) (NOYES), A., i, 632.
- $\delta\delta$ -Dimethylallylacetacetic acid, ethyl ester (IPATIEFF), A., i, 256.
- Dimethylallylcarbinol, hydrocarbon, C_6H_{10} , from (LJUBARSKY), A., i, 181.
- Dimethylaminobenzaldehyde, action of, on urine (PRÖSCHER), A., ii, 260.
- 2-Dimethylaminobenzoylbenzoic acid, its amide, chloride, and phenylhydrazide, 3:6-dichloro- (SEVERIN), A., i, 386.
- nitro- (HALLER and GUYOT), A., i, 324.
- Dimethylaminobenzoyltetrachlorobenzoic acid, nitro- and nitroso- (HALLER and UMBROVE), A., i, 644.
- Dimethylamino-benzoyl- and -benzyl-tetrachlorobenzoic acids and the acetate, anhydride, and esters of the benzoyl derivative (HALLER and UMBROVE), A., i, 469.
- p*-Dimethylaminobenzylidenecarbituric acid and its hydrochloride (WEINSCHENK), A., i, 528.
- 4-Dimethylaminobenzylideneindanedione, and 3-nitro- (NÖLTING and BLUM), A., i, 728.
- p*-Dimethylaminobenzylideneindanone (FEIERSTEIN), A., i, 279.
- Dimethylaminocycloheptane and its salts and 4-Dimethylaminocycloheptanol (WILLSTÄTTER), A., i, 225.
- Dimethylaminocycloheptenes. See Methyltropans.
- Dimethylaminohydroxyanthraquinonesulphonic acid (HALLER and GUYOT), A., i, 280.
- Dimethylaminomethylenementhone (FARBWERKE VORM. MEISTER, LUCIUS, and BRÜNING), A., i, 692.
- p*-Dimethylaminophenylaminobenzyl cyanide (SACHS), A., i, 272.
- 4-Dimethylamino-1-phenyl-2:3-dimethyl-5-pyrazolone salts (EBERT and REUTER), A., i, 294.
- Dimethylaminophenylglyoxylic acid and its phenylhydrazine (BOEHRINGER & SONS), A., i, 713, 714.
- p*-Dimethylaminophenylmercuric salts (DIMROTH), A., i, 440.
- Dimethylamylcarbinol (*octyl alcohol*) (MASSON), A., i, 250.
- Dimethylisoamylcarbinol (*octyl alcohol*) and its acetate (GRIGNARD), A., i, 680.
- Dimethylanhydracetonebenzils, $\alpha\beta$ - and $\beta\beta$ -, and their isomeride (JAPP and MELDRUM), T., 1036; P., 1901, 175.
- Dimethylaniline, action of cyanogen bromide on (SCHOLL and NÖRR), A., i, 376.
- action of mercury fulminate on (SCHOLL and BERTSCH), A., i, 523.
- oxide, preparation of and action of heat on (BAMBERGER and LEYDEN), A., i, 200.
- Dimethylaniline, *m*- and *p*-nitro-, electrolytic reduction of (ROHDE), A., i, 135.
- Dimethylanilinephthalein, amino- and nitro-, and the acetyl derivative and isomeride of the amino-compound (HALLER and GUYOT), A., i, 325.
- Dimethylanilinethiosulphonic acid (CLAYTON ANILINE Co.), A., i, 694.
- 2:5-Dimethylbenzaldehyde, and its phenylhydrazone, oxime, aldazine, and aniline and benzylidene derivatives (HARDING and COHEN), A., i, 725.
- 1:3-Dimethyl-benziminazole, and -benziminazolone, and their salts (FISCHER and FUSSENEGER), A., i, 414.
- 1:5-Dimethylbenziminazole tartrate (PINNOW), A., i, 485.
- 2:4-Dimethylbenzoic acid (*xylic acid*), formation of (LEES and PERKIN), T., 347; (PERKIN and YATES), T., 1383.
- 2:5-Dimethylbenzoic acid (HARDING and COHEN), A., i, 725.
- 6:8-Dimethyl-1:4-benzopyrone and its 2-carboxylic acid (RUEHMANN and WRAGG), T., 1189; P., 1901, 187.
- 2:4-Dimethylbenzoylbenzene-*o*-sulphonic acid and its salts (KRANNICH), A., i, 153.
- Dimethyltetrabromohydrindacenedicarboxylic acid (EPHRAIM), A., i, 688.
- $\beta\beta$ -Dimethylbutane- $\alpha\alpha\delta$ -tricarboxylic acid and its triethyl ester and calcium salt (NOYES), A., i, 631.
- Dimethylbutane- $\alpha\gamma\gamma$ -tricarboxylic acid, ethyl ester (MICHAEL), A., i, 124.
- Dimethylbutylene. See Hexylene.
- Dimethylcincholeuponic acid and its diethyl ester and salts (SKRAUP), A., i, 226.
- 2:5-Dimethylcinnamic acid (HARDING and COHEN), A., i, 726.
- 4:6-Dimethylcoumaranone, synthesis of, and its oxime (STOERNER and BARTSCH), A., i, 95.

- Dimethylcoumarone**, *tri-* and *tetra-*bromo- (V. BAEYER and SEIFFERT), A., i, 217.
- $\beta\zeta$ -Dimethyl- β -decene- θ -ol** and its acetate (GRIGNARD), A., i, 679.
- Dimethyldiazoaminotoluene**, *dinitro-*diamino- (PINNOW), A., i, 128.
- Dimethyldiethyltetrachlororhodamine** (HALLER and UMBROVE), A., i, 644.
- Dimethyldihydroisoidole** and its salts (FRÄNKEL), A., i, 45.
- Dimethyldihydrophthalidetetronic acid** (WOLFF and GABLER), A., i, 285.
- 3:6-Dimethyl-2:5-diketopiperazine** (FISCHER), A., i, 192.
- δ -Dimethylethylenes**. See ψ -Butylenes.
- Dimethylethylethoxyketopentamethylenedicarboxylic acid** (PERKIN and THORPE), T., 771; P., 1901, 112.
- $\alpha\alpha$ -Dimethyl- β -ethylhydracrylic acid**. See β -Hydroxy- $\alpha\alpha$ -dimethylvaleric acid.
- Dimethylethylhydroxybutanetetra-carboxylic acid**, lactone of (PERKIN and THORPE), T., 772; P., 1901, 112.
- Dimethylethylhydroxybutanetricarboxylic acids**, lactones of (PERKIN and THORPE), T., 773; P., 1901, 112.
- Dimethylethyltrimethylenedicarbonimides**, 1:4:4- and 4:4:1-, 3:5-dicyano- (GUARESCHI), A., i, 342.
- Dimethylfulvene**. See *iso*Propylidene-cyclopentene.
- Dimethylglutaconic acid** and its ethyl ester (PERKIN), P., 1900, 214.
- $\alpha\alpha$ -Dimethylglutaric acid** (*pentanedicarboxylic acid*), bromo-, ethyl ester (PERKIN), P., 1900, 214.
- $\beta\beta$ -Dimethylglutaric acid** (*pentanedicarboxylic acid*) (GUARESCHI), A., i, 630.
- and anhydride, preparation and bromination of (PERKIN and THORPE), T., 753; P., 1901, 112; (PERKIN, THORPE, and WALKER), T., 785.
- $\alpha\alpha$ -dicyano-, ethyl ester** (KOMPPA), A., i, 114.
- $\beta\zeta$ -Dimethyl- $\delta\zeta$ -heptadiene**. See Noninene.
- $\alpha\epsilon$ -Dimethylheptenoic acid** (*nonylenic acid*) and its amide and nitrile (TIEMANN, LEMME, and KERSCHBAUM), A., i, 18.
- Dimethylhexamethylene**, chloro- (MABERY and SIEPLEIN), A., i, 306.
- Dimethylcyclohexanecarboxylic acid** (*hexahydroxylic acid*), *mono-* and *di-*bromo-, methyl esters (LEES and PERKIN), T., 350; P., 1900, 20.
- Dimethylcyclohexanecarboxylic acids**, *cis-* and *trans-*, formation of (LEES and PERKIN), T., 356; P., 1900, 20.
- Dimethylcyclohexanecarboxylic acids**, bromo-, stereoisomeric (PERKIN and YATES), T., 1379.
- Dimethylcyclohexanes**, 1:2-, 1:3-, and 1:4- (SABATIER and SENDERENS), A., i, 459.
- 1:3-Dimethylcyclohexanol-3** (ZELINSKY), A., i, 661.
- 1:4-Dimethyl-3-cyclohexanone** and its oxime and 4-acetyl derivative (LESER), A., i, 278.
- Dimethylcyclohexenone** (BÉHAL), A., i, 278.
- Dimethylhexylcarbinol** (*nonyl alcohol*) (MASSON), A., i, 250.
- Dimethylhydroxypentamethylenecarboxylic acid** (PERKIN, THORPE, and WALKER), T., 783.
- 2:4-Dimethylimino- ψ -quinol** (BAMBERGER and BRADY), A., i, 143.
- Dimethylindacene** and its dicarboxylic acid and its ethyl hydrogen ester (EPIHRAIM), A., i, 688.
- Dimethylketodicyclopentanecarboxylic acid** (PERKIN, THORPE, and WALKER), T., 778.
- Dimethylketodicyclopentanedicarboxylic acids** (PERKIN, THORPE, and WALKER), T., 777.
- 5:5-Dimethyl-3-ketodicyclopentane-1:2 4-tricarboxylic acid**, ethyl ester, yellow sodium compound of, preparation and properties of (PERKIN and THORPE), T., 768; P., 1901, 110; (PERKIN, THORPE, and WALKER), T., 776; P., 1900, 150.
- Dimethylketopentamethylenecarboxylic acid** and its oxime and semicarbazone (PERKIN, THORPE, and WALKER), T., 782.
- Dimethylketotetramethylene-carboxylic acids**, isomeric, and -*tricarboxylic acid*, ethyl ester (MICHAEL), A., i, 125.
- $\beta\delta$ -Dimethylævulic acid** and its phenylhydrazine and semicarbazone (V. FECHMANN), A., i, 64.
- $\alpha\delta$ -Dimethylmalic acid** and anhydride (FICHTER and HIRSCH), A., i, 65.
- Dimethylmethylenemono- and -dicyanoacetic acids**. See β -Methylcrotonic acid, α -cyano-, and $\beta\beta$ -Dimethylglutaric acid, $\alpha\alpha$ -dicyano-.
- Dimethyl-naphthalene- and -phenylene-carbamide** (FISCHER and FUSSENEGGER), A., i, 415.
- 1:2 Dimethyl- α -naphthiminazole** and its salts (FISCHER, FEZER, and REINDL), A., i, 414.
- 1:3-Dimethylnaphthiminazolone** (FISCHER and FUSSENEGGER), A., i, 415.

- $\beta\zeta$ -Dimethyl- $\beta\theta$ -nonatriene and its isomeride and their hydrobromides (GRIGNARD), A., i, 681.
- $\beta\zeta$ -Dimethyl- $\beta\epsilon$ -nonadiene- θ -one- η -carboxylic acid, ethyl ester (CHEMISCHE FABRIK GRIESHEIM-ELEKTRON), A., i, 732.
- $\beta\zeta$ -Dimethyl- $\beta\epsilon$ -octadiene- θ -al, and its oxime, phenylhydrazone, and semicarbazone (CHEMISCHE FABRIK GRIESHEIM-ELEKTRON), A., i, 731.
- $\beta\zeta$ -Dimethyl- $\beta\epsilon$ -octadiene- θ -mono- and - $\eta\theta$ -di-carboxylic acids and the η -cyano-derivative of the θ -acid (CHEMISCHE FABRIK GRIESHEIM-ELEKTRON), A., i, 731.
- Dimethyloctomethylenediurethane (CURTIUS and STELLER), A., i, 70.
- $\beta\beta$ Dimethylol- γ -pentanol and its triacetyl derivative (KOCH and ZERNER), A., i, 633.
- $\alpha\alpha$ -Dimethylolpropaldehyde and its acetyl derivative, and their oximes (KOCH and ZERNER), A., i, 633.
- $\alpha\alpha$ -Dimethylolpropionitrile and its acetyl derivative (KOCH and ZERNER), A., i, 633.
- $\beta\delta$ -Dimethyl- $\beta\delta$ -pentadiene. See Heptinene.
- Dimethylpentamethylene, chloro- (MABERY and STIEPLEIN), A., i, 306.
- 2:2-Dimethylcyclopentane-5-one-1:1-dicarboxylic acid, ethyl ester (NOYES), A., i, 631.
- 2:5-Dimethylcyclopentane-1-mono- and -1:1-di-carboxylic acids, *cis-cis*, and *cis-trans*, and their esters and salts (WISLICENUS, PETERS, SCHRAMM, and MOHR), A., i, 664.
- Dimethyl-phenoxazines and -phenoxazonium salts (KEHRMANN), A., i, 484.
- 3:7-Dimethyl-5-phenylacridine, 2:8-diamino- (BADISCHE ANILIN- and SODA-FABRIK), A., i, 753.
- s-Dimethyl-o-phenylenediamine and its hydrochloride, and action of acetic anhydride on (FISCHER and FUSSEN-EGGER), A., i, 414.
- 2:4-Dimethylphenylhydroxylamine (BAMBERGER and BRADY), A., i, 142.
- Dimethylphloroglucinol benzyl ethers (KAUFER), A., i, 207.
methyl ether, proof of the position of the methyl groups in (BOSSE), A., i, 207.
methyl ethers (HERZIG and HAUSER), A., i, 206.
- Dimethylphloroglucinolcarboxylic acid, methyl ester, and its acetates (HERZIG and WENZEL), A., i, 473.
- 1:1-Dimethylcyclopropane. See 1:1-Dimethyltrimethylene.
- Dimethylpropane- $\alpha\gamma\gamma$ -tricarboxylic acid, ethyl ester (MICHAEL), A., i, 124.
- Dimethylcyclopropylcarbinol (ZELINSKY), A., i, 661.
- 1:3-Dimethyl-4-isopropylcyclohexanol-3 (ZELINSKY), A., i, 661.
- Dimethylpurones (TAFEL), A., i, 238.
- 2:4-Dimethylpyridine, 6-amino-3-cyano- (MOIR), P., 1901, 69.
- Dimethylpyridines, 2:3- and 2:5-, from Scottish shale oil (GARRETT and SMYTHE), P., 1900, 190.
See also Lutidine.
- 4:5-Dimethylpyrimidine and its salts, chloro-, chloroamino-, and amino-derivatives (SCHLENKER), A., i, 763.
6-thio-, and its salts and 2-amino-derivative, and 2:6-dithio- (SCHLENKER), A., i, 763.
- 2:5-Dimethylpyrrole-1-acetic acid (FISCHER), A., i, 192.
- Dimethylpyruvic acid and its ethyl ester, and their oximes, and phenylhydrazone of the acid, and semicarbazone of the ester (BOUVEAULT and WAHL), A., i, 252.
reactions of (WAHL), A., i, 364.
- 2:4-Dimethyl- ψ -quinol and its hydrate and benzoyl derivative (BAMBERGER and BRADY), A., i, 142.
- 2:8-Dimethylquinoline, picrate of (EIBNER), A., i, 611.
- as-Dimethylsuccinic acid (*butanedi-carboxylic acid*) and anhydride, bromo- (FICHTER and HIESCH), A., i, 65.
- aa-Dimethylsuccinic acid (*butanedi-carboxylic acid*) (PERKIN and THORPE), T., 762; (PERKIN, THORPE, and WALKER), T., 781; P., 1900, 149.
- Dimethylthujylamine and its salts (TSCHUGAEFF), A., i, 601.
- Dimethyl-o-toluidine, *m*-nitro- (Me: $\text{NM}_2\text{:NO}_2=1:2:4$) and its reduction (RONDE), A., i, 135.
- Dimethyl-*p*-toluidine, 3-nitro-, hydrochloride, double salt of, with stannic chloride (PINNOW), A., i, 485.
- Dimethyl-*m*-toluidineazo-*p*-anisole, -*p*-phenetole, and -*m*- and -*p*-toluene and their salts (SAMELSON), A., i, 170.
- Dimethyl-*m*-toluidineazobenzene and its sulphonic acid (SAMELSON), A., i, 170.
- 1:1-Dimethyltrimethylene (1:1-dimethylcyclopropane), action of bromine on (GUSTAVSON), A., i, 61.
- Dimethyltrimethylenedicarboxylic acid, and its ethyl ester, anilide, and anil acid (PAOLINI), A., i, 253.

- 4:5-Dimethyluracil. See 2:6-Dioxy-4:5-dimethylpyrimidine.
- Dimethyluracils, formule of (BEHREND, MEYER, and BUCHHOLZ), A., i, 136.
- 2:6-Dimethylxanthine. See Theophylline.
- Di- α - and - β -naphthalenethiolsulphonic acids, diazoaryl esters (TRÖGER and EWERS), A., i, 172.
- Dinaphthaphenazine-furan and -oxazine (LINDENBAUM), A., i, 424.
- Dinaphthaxanthen (FOSSE), A., i, 384. and bromo- and chloro- (FOSSE), A., i, 644.
- Dinaphthaxanthone, chloro- and bromo- (FOSSE), A., i, 604.
- Di- α -naphthylcarbamide, formation of (DIXON), T., 106; P., 1900, 208.
- Dinaphthylene alcohol. See 2:2':2'':Trihydroxy-1:1':1''-trinaphthylmethane, *es*anhydride of.
- Dinaphthylene glycol, so-called, action of hydrobromic and hydrochloric acids on (FOSSE), A., i, 643. anhydride, so-called (FOSSE), A., i, 384.
- α -Dinaphthylene oxide (HÖNIGSCHMID), A., i, 700.
- Di- α -naphthylethylenediamine, action of phenylcarbimide on (SENIER and GOODWIN), T., 260; P., 1900, 228.
- Di- α - and - β -naphthylsulphonebisdiazo-diphenyl and -ditolyl (TRÖGER and EWERS), A., i, 172.
- Diethyl alcohol, synthesis of (GUERBET), A., i, 307.
- Diopside from Bosnia (KIŠPATIĆ), A., ii, 321.
- Diopase from Siberia (ZAMBONINI), A., ii, 396.
- Diosphenol (KONDAKOFF and BACHTSCHÉEFF), A., i, 334.
- 2:6-Dioxy-1-benzyl-4:4-dimethylpiperidine, 3:5-dicyano- (GUARESCHI), A., i, 342.
- 2:6-Dioxy-4:4-dialkylpiperidines, hydrolysis of (GUARESCHI), A., i, 630.
- Dioxydicyanogendicarboxylic acid and its ethyl ester, potassium salt and amides (SCHOLL and SCHÖFER), A., i, 359. ethyl ester, isomeride of (BOUEVAULT and BONGERT), A., i, 579.
- 2:6-Dioxy-4:4-diethylpiperidine, 3:5-dicyano- and its salts (PEANO), A., i, 346.
- 2:6-Dioxy-1:4-dimethyl-4-ethyl-, -4-propyl-, and -4-butyl-piperidine, 3:5-dicyano- (GUARESCHI), A., i, 343.
- 2:6-Dioxy-4:4-dimethyl-1-ethyl- and -1-ethylene-piperidine, 3:5-dicyano- (GUARESCHI), A., i, 342.
- 2:6-Dioxy-1:3-dimethylpyrimidine, 4-mono- and 4:5-di-amino- (TRAUBE), A., i, 55.
- 2:6-Dioxy-4:5-dimethylpyrimidine (SCHLENKER), A., i, 762.
- 2:6-Dioxy-4:4-dipropyl-, -4-phenyl-4-methyl-, -4-phenetyl-4-methyl-, -4-phenetyl-1:4-dimethyl-, -4-styryl-4-methyl-piperidine, 3:5-dicyano- (GUARESCHI and BALDI), A., i, 345.
- 2:6-Dioxy-4-ethyl-4-propylpiperidine, 3:5-dicyano- (GUARESCHI and BALDI), A., i, 345.
- 2:6-Dioxy-4-methyl-1:4-diethyl-, -4-ethyl-1-allyl-, -4-isopropyl-, -4-n- and -isobutyl-, -4-isohexyl-, -4-isohexenyl-, and -4-nonyl-piperidine, 3:5-dicyano- (GUARESCHI), A., i, 343.
- 3:4-Dioxymethylene-hydratropaldehyde and -hydratropic acid and its salts (BOTGAULT), A., i, 721.
- 2:6-Dioxy-1-mono- and -1:3-di-methylpyrimidine, 4-imino-. See Malonylmethylcarbamides, imino-.
- 2:6-Dioxy-3-methylpyrimidine, 4-mono- and 4:5-di-amino- (TRAUBE), A., i, 54.
- 2:5-Dioxy-3-phenylpurine, 7-amino-, and its salts (FOURNEAU), A., i, 238.
- 2:6-Dioxy-1:4:4-trimethylpiperidine, 3:5-dicyano-, and its silver salts and dibromo- (GUARESCHI), A., i, 341.
- Dicyclopentane, derivatives of (PERKIN and THORPE), T., 729; P., 1900, 149; 1901, 110.
- Diphenacyls, α - and β -bromo-, and their compounds with acid chlorides (PAAL and STERN), A., i, 476.
- Diphenol. See Dihydroxydiphenyl.
- Diphenoxy-isopropyl chloride and -isopropylphosphorous acid (BOYD), T., 1223; P., 1901, 188.
- Diphenyl, chloro- and nitro-derivatives of (ÜLLMANN and BIELECKI), A., i, 586. disulphide, and its chloronitro- and bromonitro-derivatives (BLANKSMA), A., i, 461. tri- and tetra-sulphides, di-o-nitro-, formation of (BLANKSMA), A., i, 264, 462. sulphoxide, 1:1'-dinitro- (DE BRUYN and BLANKSMA), A., i, 460.
- Diphenylacetonesemicarbazone (WEDEKIND), A., i, 499.
- Diphenyl-acetylacetoguanamine and -formoguanamine (CRAMER), A., i, 772.
- Diphenylamine, 2:4'-diamino-, dihydrochloride of (KEHRMANN and ÖTT), A., i, 767.

- Diphenylamine**, 5-chloro-2-amino-, hydrochloride of (KEHRMANN and HIBY), A., i, 418.
 3-chloro-6:4'-*di*amino- (KEHRMANN and KRAZLER), A., i, 420.
p-nitro-, and its benzoyl derivative, electrolytic reduction of (ROHDE), A., i, 136.
 2:2'- and 2:3'-nitroamino-, and 2:3'-*di*amino- (KEHRMANN and STEINER), A., i, 754.
- Diphenylamine-6-mono- and -6:6'-dicarboxylic acids**, 2:4-*di*nitro-, and their salts and acetyl and benzoyl derivatives (COHN), A., i, 642.
- Diphenylamine-3'-sulphonic acid**, 4:4'-*di*amino- (FARBWERKE VORM. MEISTER, LUCIUS, and BRÜNING), A., i, 766.
- 1:3-Diphenyl-2-amyl-4:2- β -naphthaisooxazine** (BETTI), A., i, 754.
- Diphenylazines** from 3:4:6-*tri*amino-anisole (MELDOLA and EYRE), T., 1076; P., 1901, 131, 185.
- 3:3'-Diphenylbenzidine** and its salts and acetyl derivatives (FRIEBEL and RASSOW), A., i, 575.
- $\alpha\beta$ -Diphenyl- γ -benzylhydroxyamidine** and its salts and ethers (LEY), A., i, 759.
- 1:3-Diphenyl-2-benzyl 4:2- β -naphthaisooxazine** and its acetyl derivative (BETTI), A., i, 754.
- 1:3(or 5)-Diphenyl-5(or 3)-benzylpyrazole** (BÜLOW and GROTHOWSKY), A., i, 475.
- Diphenyl-borobromide and -boric acid** (MICHAELIS and RICHTER), A., i, 355.
- $\alpha\delta$ -Diphenyl- $\alpha\gamma$ -butadiene**, *di-p*-amino- and *di-p*-nitro- α -cyano- (FREUND), A., i, 711.
- s*-Diphenylcarbamide**, bromo- and chloro-derivatives of (CHATTAWAY and ORTON), A., i, 381, 382.
- Diphenylcarbazine**, action of "saccharin" on (DÉFOURNEL), A., i, 487.
 acid and alcoholic compounds of (CAZENÈVE), A., i, 292.
 hydrochloride (CAZENÈVE), A., i, 655.
 violet colouring matters from the action of chromic acid on (CAZENÈVE), A., i, 655.
 use of, for detecting chromic acid in cotton dyed with chrome yellow (CAZENÈVE), A., ii, 626.
- 2:5-Diphenylcarbazine-1-carboxylic acid**, ethyl ester (BUSCH), A., i, 489.
- Diphenylcarbodiiazide** and its *dibromide* (CAZENÈVE), A., i, 297.
- Diphenylcarboxylic acid**, 4-amino- (DIELS), A., i, 522.
- Diphenyldiisobutylpiperazine** and its *p*-nitroso- and glyoxaline derivatives (EIBNER and PURUCKER), A., i, 168.
- Diphenyl 4:4'dicarboxylic acids**, 2:2'-*di*- and 2:2':6:6'-*tetra*-nitro-, methyl esters (ULLMANN and BIELECKI), A., i, 586.
- $\alpha\beta$ -Diphenyl- α -diethylthiolethane- β -one** (POSNER), A., i, 15.
- Diphenyldiguanide** and its salts and dibenzoyl derivative (CRAMER), A., i, 772.
- Diphenyldihydrazonecyanoacetic acid** and its ethyl ester and salts (LAX), A., i, 231.
- 1:2-Diphenyl-1:2-dihydroxycyclopentane** and $\alpha\epsilon$ -Diphenyl- $\alpha\epsilon$ -dihydroxypentane (JAPP and MICHIE), T., 1010; P., 1901, 173.
- Diphenyldisazo- α -naphthol** and the action of "Michler's hydrol" on (MÖHLAU and KEGEL), A., i, 57.
- Diphenylene oxide** and its sulphonic acid (KRAEMER and WEISSGERBER), A., i, 535.
- s*-Diphenylethane**, 4:4'-*di*cyano-, and 4:4'-dicarboxylic acid (KATTWINKEL and WOLFFENSTEIN), A., i, 594.
- s*-Diphenylethylene**. See Stilbene.
- Diphenylethylenediamine**, action of phenylcarbimide on (SENIER and GOODWIN), T., 259; P., 1900, 228.
- 1:3-Diphenyl-2-ethyl-4:2- β -naphthaisooxazine** (BETTI), A., i, 754.
- Diphenylfluorindine**, chloro- and nitro-derivatives, and the hydrochlorides of the chloro-compounds (KEHRMANN and GUGGENHEIM), A., i, 422.
- Diphenylglycollic acid**.[†] See Benzilic acid.
- s*-Diphenylglycollohydrazide** (CURTIUS and MÜLLER), A., i, 779.
- 2:4-Diphenylglyoxaline** and its salts (KUNCKELL), A., i, 293.
 and its 1-phenacyl and 1-ethyl derivatives and their ethiodides, and phenacyl bromide (KUNCKELL and DONATH), A., i, 567.
- 1:2-Diphenyl-3- β -hydroxy-, -methoxy-, and -ethoxy-propylhydrazimethylene** (RASSOW and LUMMERZHEIM), A., i, 777.
- Diphenyldiiminotetrahydro-1:2:4-thiadiazole**, bromo-, and its hydrobromide (HUGERSHOFF), A., i, 758.
- Diphenylmethane-3:3'-dicarboxylic acid**, 4:4'-*di*amino-, methyl esters and the dihydrochloride and diacyl derivatives of the dimethyl ester (MEINER), A., i, 470.
- Diphenylmethanephosphine** derivatives (MICHAELIS and GÜSEWELL), A., i, 300.

- Diphenylmethylisobiuret** and its hydrochloride (McKEE), A., i, 756.
- Diphenylmethylenedianiline** (MACKENZIE), T., 1212; P., 1901, 150.
- α -Diphenyl- α -methyleneethylisobiuret** (McKEE), A., i, 757.
- 2:4-Diphenyl-5-methylglyoxaline** and its hydrochloride (KUNCHELL), A., i, 294.
- 1:2-Diphenyl-3-methylhydrazinemethylene** (RASSOW and LUMMERZHEIM), A., i, 777.
- 1:3-Diphenyl-2-methyl-4:2- β -naphthaisooxazine** (BETTI), A., i, 754.
- 1:3-Diphenyl-4-methylisotriazole** and *p*-bromo-, *p*-iodo-, and *di*- and *tetra*-nitro-derivatives (PONZIO and ROSSI), A., i, 169; (PONZIO), A., i, 170.
- $\alpha\beta$ -Diphenyl- β -methylpropane** (BODROUX), A., i, 523.
- 3:5-Diphenyl-4-methylpyrazole** (ABELL), T., 931; P., 1901, 128.
- 1:3-Diphenyl-2-methyltrimethylene glycol** and its diacetyl derivative (ABELL), T., 930; P., 1901, 128.
- 1:3-Diphenyl-4:2- β -naphthaisooxazine** (BETTI), A., i, 612.
- Diphenylnaphthaphenosafranin** (5:9-*dicarilino-7-phenylnaphthaphenazonium*) and its chloride (KEHRMANN and HIBY), A., i, 419.
- s*-Diphenyl-*p*-nitrobenzenylamidine** (SACHS and BRY), A., i, 230.
- s*-Diphenyldinitroethane**. See Stilbene dinitrite.
- $\alpha\theta$ -Diphenyl- $\alpha\eta\eta$ -octatetrene** (FICHTER and HIRSCH), A., i, 594.
- 1:2-Diphenylcyclopentane**, oxidation of (JAPP and MICHIE), T., 1023; P., 1901, 173.
- 3:5-Diphenylisocyclopentenine** (BOEDTKER), A., i, 684.
- Diphenylcyclopentenolone**. See Anhydriacetonebenzil.
- Diphenyl-*p*-phenylenediamine**, *tetra*-nitro- (BANDROWSKI), A., i, 21.
- Diphenylphenylenemethane** (NORRIS), A., i, 198.
See also Triphenylmethyl.
- Diphenylphosphine derivatives** (MICHAELIS and BUSS), A., i, 301.
- 2:6-Diphenylpiperidines**, isomeric, and their salts (SCHOLTZ), A., i, 483.
- Diphenylpiperidylethenylamidine** and its hydrochloride, picrate, and platinum-chloride (KÜHN), A., i, 42.
- 3:6-Diphenylpyridazine** and its 4:5-dicarboxylic acid and its salts and ethyl ester (PAAL and SCHULZE), A., i, 148, 154.
- 2:5-Diphenylpyrrole**, 3-nitroso- and its phenylcarbimide (ANGELICO and CALVELLO), A., i, 747.
- 2:4-Diphenylsemicarbazide-1-carboxylic acid**, ethyl ester (BUSCH and HEINRICH), A., i, 617.
- 2:4-Diphenylsemicarbazide-1-*dithio*carboxylic acid**, methyl ester (BUSCH and WOLPERT), A., i, 234.
- Diphenylsemithiocarbazides**, isomeric, and their reactions (BUSCH and HOLZMANN), A., i, 234.
- Diphenylsilicone** (KIPPING and LLOYD), T., 455; P., 1901, 32.
- Diphenylsulphone** and its 4-carboxylic acid, amino- and nitro-derivatives of (ULLMANN and PASDERMAJIAN), A., i, 383.
- Diphenylsulphonebisdiazo-diphenyl and -ditolyl** and their *di*bromo-derivatives (TRÖGER and EWERS), A., i, 172.
- β -Diphenylsulphone- α -methyl- and - α -ethyl-butyric acids**, ethyl esters (POSNER and CLAUDIUS), A., i, 705.
- γ -Diphenylsulphonevaleric acid** and its ethyl ester (POSNER and DEINHARDT), A., i, 704.
- Diphenyltetramethylenedinitrile**, *dithio*- (WENZEL), A., i, 403.
- 2:4-Diphenylthio-carbazide- and -semicarbazide-1-carboxylic acids**, ethyl esters (BUSCH and GROHMANN), A., i, 616.
- Diphenylthiodiazoloneanil** (BUSCH and HOLZMANN), A., i, 235.
- c:b*-Diphenyl- α -thiol- and -thion-semicarbazidic esters** (WHEELER and DUSTIN), A., i, 26.
- 1:4-Diphenyl-5-thio-1:2:4-triazolone-3-thiol**, -3-sulphonic acid, -hydrothioamine and disulphide (BUSCH and WOLPERT), A., i, 233.
- Diphenyl-*m*-toluidine** (HAEUSSERMANN), A., i, 229.
- Diphenyl-*p*-tolylacetic acid** and its silver salt (BISTRZYCKI and WEHRBEIN), A., i, 712.
- 1:3-Diphenyl-2-*p*-tolyl-4:2- β -naphthaisooxazine** (BETTI), A., i, 753.
- 1:4-Diphenyl-1:2:4-triazolone-3-thiol**, -3-thiomethane, -thioaminobenzene, -thioethylaminobenzene, and disulphide (BUSCH and WOLPERT), A., i, 233.
- Diphenylurazine**, constitution of (BUSCH), A., i, 488.
- 1:4-Diphenylurazole**, 5-thio- (BUSCH and GROHMANN), A., i, 616.
- 2:4-Diphenylurazole** and its salts, acetyl derivative and methyl ether (BUSCH and HEINRICH), A., i, 617.
- $\beta\delta$ -Diphenylvalerolactoneacetic acid** (STÖBBE and RUSSWURM), A., i, 147.
- Diphenyl-*o*-xylylenemethylenediamine** (SCHOLTZ and JAROSS), A., i, 486.

- Dipicphthalic acid** and its sodium salt (V. BAEYER and VILLIGER), A., i, 326.
- Diisopropenyl.** See Hexinene.
- Dipropionyl.** See Diethyl diketone.
- Dipropylamine**, specific heat and latent heat of evaporation of (KAHLENBERG), A., ii, 492.
- Dipropyl diketone**, and its dioxime (PONZIO), A., i, 452.
- Dipropylene oxide** mercuric bromide (SAND), A., i, 682.
mercuric iodide (SAND), A., i, 458.
- Di-*n*- and -*iso*-propylformal**, heat of combustion and of formation of (DELEPINE), A., ii, 6.
- Dipropyloxydiphenylmethane** (MACKENZIE), T., 1206; P., 1901, 150.
- Di-*p*-propyloxyphenylcarbamide** (SPIEGEL and SABBATH), A., i, 534.
- Dipropylsulphamic acid** and chloride (MAMLOCK and WOLFFENSTEIN), A., i, 673.
- Dipyromucyltartaric acid**, methyl and ethyl esters, preparation and rotation of (FRANKLAND and ASTON), T., 518; P., 1901, 41.
- Disaccharides**, synthesis of (FISCHER and ARMSTRONG), A., i, 189.
- Disalicylide** (EINHORN and PFEIFFER), A., i, 712.
- Dispersion.** See Photochemistry.
- Dissociated groups**, formation and breaking down of complex, and change of position of free affinity in (LAPWORTH), T., 1266; P., 1901, 93.
- Dissociation**, phenomenon of (BONNEFOI), A., ii, 653.
studies in (BANCROFT), A., ii, 307.
between univalent groups as an explanation of isomeric change and interaction (LAPWORTH), T., 1265; P., 1901, 93.
of gaseous compounds and Gay-Lussac's law (PONSOT), A., ii, 542.
and dissociation equilibrium in highly dissociated electrolytes (JAHN), A., ii, 491, 592.
of electrolytes (HENSEN), A., ii, 540.
of strong electrolytes (SACKUR), A., ii, 591.
calculation of degree of, of strong electrolytes (ARRHENIUS), A., ii, 144, 435; (SAND), A., ii, 303; (NERNST), A., ii, 647.
relation between the degree of, and the dissociation constant of an electrolyte in presence of other electrolytes (OSAKA), A., ii, 371.
degree of, in mixed potassium chloride and nitrate solution (SACKUR), A., ii, 636.
- Dissociation in dilute solutions** (TARUGI and BOMBARDINI), A., ii, 89.
of the alkyl haloids, nitrates, and sulphates (NEF), A., i, 626.
of the compound $Al_2Cl_6 \cdot 18NH_3$ (BAUD), A., ii, 303.
of antimony pentachloride (NOTHOMB), A., ii, 88.
of copper-ammonia sulphate, influence of temperature on the (DAWSON and McCRAE), T., 1072; P., 1901, 178.
of polyhaloid salts in aqueous solution (DAWSON), T., 238; P., 1900, 215.
of the sulphur molecule, S_8 (BILTZ), A., ii, 649.
- Dissociation constant** of silver oxide (LEVI), A., ii, 654.
of α -alkyl substitution derivatives of adipic, glutaric, and pimelic acids (MELLOR), T., 128; P., 1900, 215.
- Dissociation media** and inorganic solvents (WALDEN), A., ii, 11; (TOLLOCZKO), A., ii, 437.
- Dissociation pressures** and temperatures of compounds of aromatic amines with metallic salts (TOMBECK), A., i, 164.
- Disthene**, constitution of (ZULKOWSKI), A., ii, 169.
- Disulphones** (POSNER), A., i, 14, 88, 474, 703.
- Ditelluro-anisyl trisulphide** and -phenetyl tri- and penta-sulphides (ROHRBAECH), A., i, 273.
- Di-*o*- and -*p*-toluenethiolsulphonic acids**, diazoaryl esters (TRÜGER and EWERS), A., i, 172.
- 5:9-Di-*p*-toluidino-7-*p*-tolyl naphtha-phenazonium chloride** (KEHRMANN and KRAZLER), A., i, 420.
- Di-*o*-tolylacetylacetoguanamide** (CRAMER), A., i, 772.
- p*-Ditolylboric anhydride** (MICHAELIS and RICHTER), A., i, 356.
- Di-*o*- and -*p*-tolylcarbamides**, formation of (DIXON), T., 102; P., 1900, 208.
- Di-*o*- and -*p*-tolyl-diguanides** and their salts and -formoguanamine (CRAMER), A., i, 772.
- Di-*o*-tolyl dihydrazonocyanoacetic acid**, ethyl ester and sodium salt (LAX), A., i, 231.
- Di-*p*-tolyl disulphone** (V. MEYER, NACKE, and GMEINER), A., i, 264.
- Di-*m*-tolylethylenecarbamide** and **Di-*o*-tolylethylene-dicarbamic chloride** and -diurethane (SCHOLTZ and JAROSS), A., i, 487.
- Ditolylethylenediamines**, *o*-, *m*- and *p*-, action of phenylcarbimide on (SENIER and GOODWIN), T., 259; P., 1900, 228.

- Di-*p*-tolynaphthaphenosafranine** and its chloride (KEHRMANN and HIBY), A., i, 419.
- Di-*p*-tolyl-oxy-isopropyl chloride** and **-isopropylphosphorous acid** (BOVD), T., 1226; P., 1901, 189.
- p*-Ditolylphosphine** derivatives (MICHAELIS and SÖCHTIG), A., i, 301.
- Di-*o*- and -*p*-tolylsulphonebisdiazo diphenyl and -ditolyl** (TRÖGER and EWERS), A., i, 172.
- Di-*p*-tolylsulphonohydroxylamine** and its benzoyl derivative (V. MEYER, NACKE, and GMEINER), A., i, 264.
- Di-*p*-tolylsulphonomethylamine** (V. MEYER, NACKE, and GMEINER), A., i, 264.
- 1:3-Di-*m*- and -*p*-tolyltetrahydroglyoxalines** and the 2-methyl derivative of the *m*-compound (SCHOLTZ and JAROSS), A., i, 486.
- Ditolylthiophosphine** derivatives (MICHAELIS and SCHÜNHERR), A., i, 302.
- Di-*p*-tolyl-*o*-xylylene-diamine** and **methylenediamine** (SCHOLTZ and JAROSS), A., i, 486.
- Di-2:4:5-trimethylbenzylamine** and its salts and nitrosoamine (CURTIUS and FRANZEN), A., i, 293.
- Di-2:4:5-trimethylbenzylhydrazine** and its hydrochloride (CURTIUS and FRANZEN), A., i, 293.
- Ditriphenylsilicly ether** (KIPPING and LLOYD), T., 455; P., 1901, 32.
- Diundecenylthiocarbamide** (KRAFFT and TRITSCHLER), A., i, 115.
- s-Diisovalerylhydrazide** (AUTENRIETH and SPIESS), A., i, 230.
- Di-1:2:4-xylyl-diguamide** and **-dithiocarbamide** (CRAMER), A., i, 772.
- Dixyl-ethylenediamine** and **-piperazine** (SCHOLTZ and JAROSS), A., i, 486.
- Dixyl-ethylenediamine** and its nitrate, mercurichloride and platinichloride, and its nitro-derivatives, and the action of phenylcarbimide on (SENIER and GOODWIN), T., 254; P., 1900, 228.
- Dixylpiperazine** (SENIER and GOODWIN), T., 256; P., 1900, 228.
- Dodecanaphthene, chloro-** (MABERY and SIEPLEIN), A., i, 306.
- n*-Dodecoic anhydride** (*n*-lauric anhydride) (KRAFFT and ROSINY), A., i, 113.
- Dodecyl alcohol** (*methyl-diisocamylcarbinol*) (GRIGNARD), A., i, 250, 650.
- Dogs.** See Agricultural Chemistry.
- Dog-wood, Jamaica, constituents of** (FREER and CLOVER), A., ii, 333.
- Dolomite** from Ceylon (SCHIFFER), A., ii, 110.
- from Magdeburg (FAHRENHORST), A., ii, 248.
- Dolomites** from Iowa (KNIGHT), A., ii, 398.
- Domeykite** from Lake Superior (KOENIG), A., ii, 109.
- Drainage water.** See Agricultural Chemistry.
- Dressings, surgical, value of alcohols in** (BUCHNER, FUCHS, and MEGELE), A., ii, 562.
- impregnation and analysis of (UTZ), A., ii, 131.
- analysis of (FRERICHS), A., ii, 203.
- estimation of bismuth in, volumetrically (FRERICHS), A., ii, 201.
- estimation of iodoform in (FRERICHS), A., ii, 42, 204.
- estimation of mercuric chloride in (FRERICHS), A., ii, 204; (UTZ), A., ii, 348.
- estimation of phenol when mixed with resinous substances in (THRESH), A., ii, 698.
- estimation of phenol, salicylic acid and salol in (TELLE), A., ii, 698.
- Drugs, influence of, on hepatic metabolism** (NOËL PATON and EASON), A., ii, 253.
- estimation of alkaloids in (GORDIN), A., ii, 485.
- "Dulcin"** (*phenetolcarbamide*), detection and estimation of, in articles of food (BELLIER), A., ii, 50.
- Dunite** from Koswinsky-Kamen, Urals (DUPARC and PEARCE), A., ii, 664.
- Durene, bromination and iodination of** (EDINGER and GOLDBERG), A., i, 23.
- Dust, mineral constituents of** (HARTLEY and RAMAGE), A., ii, 399.
- Dypnone, sulphonal derivatives of** (POSNER), A., i, 474.
- Dyeing, theories of** (SISLEY), A., i, 99.

E.

- Earthnut meal.** See Agricultural Chemistry.
- Earths, rare, radio-active** (HOFMANN and STRAUSS), A., ii, 19.
- luminescence spectra of (BAUR and MARC), A., ii, 634.
- error of the sulphate method for the determination of the equivalents of the (BRAUNER and PAVLIČEK), P., 1901, 63.
- combination of hydrogen and of nitrogen with metals of the (MATIGNON), A., ii, 60, 61.
- salts of the (KRAUS), A., ii, 453.

Earths, rare, salts of the, isomorphism between the, and bismuth salts (BODMAN), A., ii, 454.

See also Cerite metals.

Ecgonic acid (WILLSTÄTTER and BODE), A., i, 291.

r-**Ecgonic acid, synthesis of** (WILLSTÄTTER and HOLLANDER), A., i, 561.

i-**Ecgonine and its salts** (WILLSTÄTTER and BODE), A., i, 483.

Echinoderms, digestion and metabolism in (COHNHEIM), A., ii, 668.

Echinopsine and its salts, β -Echinopsine, Echinopseine, and Echinopsfluorescein (GRESHOFF), A., i, 338.

Edestan (OSBORNE), A., i, 781.

Edestin, behaviour of, to acid and alkali (OSBORNE), A., i, 781.

decomposition products of (LEVENE and MENDEL) A., i, 656.

Egg-albumin. See Albumin.

Eggs, frogs', action of isotonic solutions of chlorides and sugar on (RONDEAU-LUZEAU), A., ii, 400; (BATAILLON), A., ii, 401.

hens', iron in (HOFFMANN), A., ii, 608.
unfertilised, division of (MATTHEWS), A., ii, 28.

Elaidamine and its salts and benzoyl derivative (KRAFFT and TRITSCHLER), A., i, 116.

Elaidic chloride, amide, and nitrile (KRAFFT and TRITSCHLER), A., i, 116.

Elasmobranchs, gastric digestion in (WEINLAND), A., ii, 252, 458.

Elder tree bark, constituents of (MALMÉJAC), A., ii, 572.

ELECTROCHEMISTRY:—

Accumulator, theory of the (ABEL), A., ii, 537.

Accumulators, lead, gaseous polarisation in (REED), A., ii, 218.

Cell, chlorine-hydrogen gas (AKUNOFF), A., ii, 81; (MÜLLER), A., ii, 537.
concentration, E.M.F. of (LEHFELDT), A., ii, 4, 433; (KAHLENBERG), A., ii, 81; (ARRHENIUS), A., ii, 144; (JAHN), A., ii, 299; (SAND), A., ii, 303; (NERNST), A., ii, 370; (SACKUR), A., ii, 591.

Daniell, pyrogenic (SUCHY), A., ii, 369.

galvanic, theory of, and its connection with autoxidation (HABER), A., ii, 299.

gold | sulphuric acid, E.M.F. of (BOSE and KOCHAN), A., ii, 590.

Grove, E.M.F. of (BOSE), A., ii, 589.

Kohrausch-Ostwald conductivity, modified form of (CUSHMAN), A., ii, 596.

ELECTROCHEMISTRY:—

Cell, magnesium | sodium or potassium hydroxide, behaviour of magnesium in (CAMPETTI), A., ii, 590.
oxygen-hydrogen, E.M.F. of (WILSMORE), A., ii, 2.

influence of platinum catalysis on (HÖBER), A., ii, 151.

standard, researches on (JAEGER and LINDECK), A., ii, 368.

Weston cadmium (COHEN), A., ii, 142.

behaviour of (JAEGER and LINDECK; WIND), A., ii, 368.

with a depolariser which is spontaneously regenerated by direct reoxidation by the air (ROSSET), A., ii, 434.

Conductivity of air and salt vapour (WILSON), A., ii, 490.

of aqueous solutions of double salts (LINDSAY), A., ii, 143; (JONES and CALDWELL), A., ii, 375.

change of, with temperature up to and above the critical temperature in solutions of salts in liquid sulphur dioxide (HAGENBACH), A., ii, 434.

of dilute solutions of salts which are hydrolytically dissociated in aqueous solutions (SALVADORI), A., ii, 4.

of some metals and non-metals (JAEGER and DIESSELHORST; RIETZSCH), A., ii, 84.

of aqueous solutions of alkali chlorides and nitrates (KÖHLRAUSCH and MALTBY), A., ii, 82.

of solutions of alkali iodates, and a formula for calculating the conductivity (KÖHLRAUSCH), A., ii, 221.

of solutions of potassium chloride, hydrogen chloride, and potassium hydroxide, influence of cane sugar on (MARTIN and MASSON), T., 707; P., 1901, 91.

of solutions of stannous chloride and hydrochloric acid (YOUNG), A., ii, 318.

of cobalt and platinum bases (WERNER and HERTY), A., ii, 638.

of electrolytes, influence of non-electrolytes on the (HANTZSCH), A., ii, 54.

in gases by the motion of negatively charged ions (TOWNSEND), A., ii, 221; (TOWNSEND and KIRKBY), A., ii, 434.

in gases and vapours (HAGENBACH), A., ii, 434.

ELECTROCHEMISTRY :—

- Conductivity** in gases exposed to the action of cathode rays (McLENNAN), A., ii, 490.
 of the sodium salt of methyl α -cyano- β -hydroxyacrylate (DE BOLLE-MONT), A., i, 117.
- Current**, apparatus for alternating a direct (HOLROYD), T., 1330.
 pyrogenetic reactions induced by the (LÖB), A., ii, 371.
 of high frequency, action of, on the secretion of urine (DENOYÈS, MARTRE, and ROUVIÈRE), A., ii, 564, 611.
- Dielectric constant** of some gases and vapours, and its dependence on temperature (BÄDEKER), A., ii, 220.
 of pure liquids (TURNER), A., ii, 53.
 of nitriles (SCHLUNDT), A., ii, 299.
 determination of the, of substances of the pyridine and piperidine series (LADENBURG), A., ii, 634.
- Electro-affinity** of the metals (DAWSON and McCRAE), A., ii, 222.
- Electrocapillary** action of non-dissociated molecules (GOURY), A., ii, 592.
 phenomena (PALMAER), A., ii, 370.
 properties of mixtures, and electrocapillary viscosity (GOURY), A., ii, 83, 435.
- Electromagnetic theory**, Poynting's theorem relating to (WEDELL-WEDELLSBORG), A., ii, 82.
- Electric discharge**, silent, chemical actions caused by the (BERTHELOT), A., ii, 2.
 action of, on sulphur perfluoride (BERTHELOT), A., ii, 15.
- Electrical arrangements** in the chemical laboratory of the Mining School at Clausthal (KÜSTER), A., ii, 217.
- Electric conductors**, soap solutions as (SMITS), A., ii, 12.
- Electrical effects** caused by liquid hydrogen (DEWAR), A., ii, 598.
- Electric furnace**, improved, for laboratory use (TUCKER and MOODY), A., ii, 596.
 for the preparation of alloys (HAMILTON and SMITH), A., ii, 385.
- Electric spark**, use of, for the analysis of gases (BERTHELOT), A., ii, 685.
- Electrical properties** of chromium during dissolution in acids (BRAUER), A., ii, 635.
- Electrochemical behaviour** of acetylene (COEHN), A., ii, 539.

ELECTROCHEMISTRY :—

- Electrochemical** behaviour of nickel ammonium sulphate (PFANHAUSER), A., ii, 538.
 reduction (HABER), A., ii, 638.
 relations between the allotropic modifications of metals (BERTHELOT), A., ii, 301.
 studies of the solubility of precipitates containing heavy metals (IMMERWAHR), A., ii, 301.
- Electrode potentials** (WILSMORE; OSTWALD), A., ii, 2; (WILSMORE and OSTWALD), A., ii, 142.
- Electrodes**, concentration at the, in a solution (SAND), A., ii, 82.
 drop, theory of the (BERNSTEIN), A., ii, 636.
 gas, equilibria at (BOSE), A., ii, 635.
 hydrogen and calomel, comparison of (WILSMORE; OSTWALD), A., ii, 2; (WILSMORE and OSTWALD), A., ii, 142.
 new, sensitive to light (BOSE and KOCHAN), A., ii, 590.
- Electrolysis**, production of active oxygen by (BOEHRINGER & SONS), A., ii, 649.
 of fused salts (LORENZ), A., ii, 538.
 of salts in organic solvents (SPERANSKY and GOLDBERG), A., ii, 157.
 of fused alkali chlorides (FISCHER), A., ii, 96.
 of ammonium oxalate, formation of carbon during the (VERWER), A., ii, 693.
 of calcium chloride (TUCKER and MOODY), A., ii, 98.
 of solutions of carboxy- and oxy-haemoglobin (GANGEE), A., i, 782.
 of a mixture of copper sulphate and sulphuric acid (SAND), A., ii, 82.
 of hydrochloric acid (MELLOR), T., 219; P., 1900, 221.
 of hydroxy-acids (HAMONET), A., i, 187.
 of molten lead iodide and of lead chloride (AUERBACH), A., ii, 590.
 of phenol in presence of hydrogen haloids (ZEHRLANT), A., i, 382.
 of uranium nitrate (OECHSNER DE CONTINCK and CAMO), A., ii, 556.
 of uric acid and its methylated derivatives (TAFEL), A., i, 236, 237.
- Electrolytes**, strong, behaviour of (SACKUR), A., ii, 636.
 strong, applicability of the law of mass action to (V. STEINWEHR), A., ii, 539.

ELECTROCHEMISTRY :—

- Electrolytes**, freezing point depressions for aqueous solutions of (MACGREGOR), A., ii, 223.
 diagram of freezing point depressions for (MACGREGOR), A., ii, 8.
 electrometric method to determine the presence of, whose ions are transported at different speeds (OKER-BLOM), A., ii, 541.
 dissociation of (HENSEN), A., ii, 540; (SACKUR), A., ii, 591.
 calculation of degree of dissociation of strong (ARRHENIUS), A., ii, 144, 435; (SAND), A., ii, 303; (NERNST), A., ii, 647.
 highly dissociated, degree of dissociation and dissociation equilibrium in (JAHN), A., ii, 491, 592.
 relation between the dissociation constant and the degree of dissociation of an, in presence of other electrolytes (ŌSAKA), A., ii, 371.
 solid and fused, decomposition potentials of (GARRARD), A., ii, 54.
 toxic action of, on fishes (KAHLENBERG and MEHL), A., ii, 327.
 amphoteric (WINKELBLECH), A., ii, 370.
Non-electrolytes, freezing point of aqueous solutions of (LOOMIS), A., ii, 492.
 influence of, on the conductivity of electrolytes (HANTZSCH), A., ii, 54.
 influence of, on the hydrolysis of ethyl acetate (KULLGREN), A., ii, 496.
Electrolytic analysis, apparatus for (MARSHALL), A., ii, 190.
Electrolytic dissociation, theory of (KAHLENBERG, KOCH, and HALL), A., ii, 540.
 lecture experiment illustrating the (NOYES and BLANCHARD), A., ii, 91.
 of salts in aqueous solution, influence of alcohols and other organic substances on the (DITZ), A., ii, 222.
Electrolytic deposition of chromium (FÉRÉ), A., ii, 513.
 of copper (DICKSON), A., ii, 159.
 rate of, in presence of sulphuric acid (SIEGRIST), A., ii, 370.
 of iron and nickel from mixed solutions of their sulphates (KÜSTER), A., ii, 555.
 of lead (GLASER), A., ii, 158.

ELECTROCHEMISTRY :—

- Electrolytic formation** of alkali metals from fused alkali chlorides (FISCHER), A., ii, 96.
 of alkali ferrates (HABER and PICK), A., ii, 103; (PICK), A., ii, 554.
 of alkali periodates (MÜLLER), A., ii, 380.
 of benzidine (LÖB), A., i, 487.
 of calcium chlorate and hypochlorite (TUCKER and MOODY), A., ii, 98.
 of ferrous ferric oxide (KAUFMANN), A., ii, 554.
 of iodoform (ELES and FOERSTER), A., i, 109.
Electrolytic oxidation of toluene (MERZBACHER and SMITH), A., i, 134; (PULS), A., i, 318.
 of nitrotoluenes (PIERON), A., i, 685.
Electrolytic reduction of barbituric acid (TAFEL and WEINSCHENK), A., i, 72.
 of guanine (TAFEL and ACH), A., i, 426.
 of methyluracil (TAFEL and WEINSCHENK), A., i, 71.
 of nitrites (SULER), A., ii, 637.
 of nitro-compounds (ELBS), A., i, 74; (ROHDE), A., i, 135.
 of aromatic nitro-compounds to amines (ELBS and SILBERMANN), A., i, 459; (CHILESOTTI), A., i, 587; (BOEHRINGER & SONS), A., i, 684.
 of *o*-nitroanthraquinone and of 1:5- and α -dinitroanthraquinone (MOLLER), A., i, 598, 646.
 of nitrourea (HOLROYD), T., 1326; P., 1901, 197.
 of xanthine (TAFEL and ACH), A., i, 425.
Electrolytic synthesis of organic substances (ELBS and FOERSTER), A., i, 109.
 of *n*-decanedicarboxylic acid (WALKER and LUMSDEN), T., 1199; P., 1901, 188; (KOMPPA), A., i, 365.
Electrolytic solution pressure (LEHFELDT), A., ii, 4, 5; (KRÜGER), A., ii, 145.
Electrolytic transference of ions, determination of the constitution of complex salts by the (RIEGER), A., ii, 638.
Electromotive behaviour of compounds with several stages of oxidation (LUTHER), A., ii, 301; (ABEL), A., ii, 490; (BRAUER), A., ii, 635.

ELECTROCHEMISTRY :—

- Electromotive force** and osmotic pressure (LEHFELDT), A., ii, 4, 5 ; (KRÜGER), A., ii, 145.
- contact**, and the theory of ions (ROTHÉ), A., ii, 490.
- of electrolytic cells, influence of the addition of a salt with one similar ion on the (SACKUR), A., ii, 636.
- of chromium (MICHELI), A., ii, 82.
- Ohm's law**, apparatus to illustrate (MILLER and KENRICK), A., ii, 56.
- Ions**, nomenclature of the (WALKER), A., ii, 636.
- theory of, and contact electromotive forces (ROTHÉ), A., ii, 490.
- theory of, in connection with auto-oxidation (HABER), A., ii, 299.
- produced in air, diffusion of, by the action of a radio-active substance, ultra-violet light, and point discharges (TOWNSEND), A., ii, 3.
- electro-striction of, in organic solvents (CARRARA and LEVI), A., ii, 3.
- model illustrating the mobility and transference of (STEELE), A., ii, 540.
- colour of (VAILLANT), A., ii, 595.
- effect of, on the contraction of the lymph hearts of the frog (MOORE), A., ii, 257.
- Ionic charges**, effect of the interaction of, on osmotic pressure (V. TÜRIN), A., ii, 375.
- migration, speed of, in dilute solutions (JAHN, BERLINER, BODAN, BUKSCHNEWSKI, GOLD-HABER, METELKA, OPPENHEIMER, and REDLICH), A., ii, 540.
- model to show (MILLER and KENRICK), A., ii, 55.
- reactions, difference between, and molecular reactions (ROHLAND), A., ii, 152.
- velocities in aqueous solution, new method of measuring (STEELE), T., 414 ; P., 1901, 5.
- Ionisation**, relation of the viscosity of mixtures of solutions of salts to their state of (BARNES), A., ii, 374.
- of atmospheric air (WILSON), A., ii, 435.
- of solutions of sodium hydroxide, carbonate, and hydrogen carbonate by addition of sodium chloride, repelling of the (SMITS and WOLFF), A., ii, 505.
- Polarisation**, cathodic, studies on (MÜLLER), A., ii, 219.

LXXX. ii.

ELECTROCHEMISTRY :—

- Polarisation**, gaseous, in lead accumulators (REED), A., ii, 218.
- of magnesium in alkaline solutions (CAMPETTI), A., ii, 590.
- Depolarisation**, cathodic, studies on (MÜLLER), A., ii, 219.
- diminution of, by potassium chromate (MÜLLER), A., ii, 218.
- Potential**, differences of, between metals and non-aqueous solutions of their salts (KAHLENBERG), A., ii, 81.
- of oxidation cells, influence of benzyl alcohol on the (SCHAUM), A., ii, 300.
- Potentials**, absolute, of the metals (WILSMORE ; OSTWALD), A., ii, 2 ; (WILSMORE and OSTWALD), A., ii, 142.
- decomposition, of fused salts, theory of the (LORENZ), A., ii, 142.
- Transport numbers**, modification of method of determining, and influence of concentration on these numbers for some ternary salts (NOYES), A., ii, 143.
- Decomposition voltages**, laboratory apparatus for (BANCROFT), A., ii, 302.
- Amperemanometer** (JOB), A., ii, 83, 222.
- Electrical thermostat** (YOUNG), A., ii, 491.
- Voltameter** as an amperemeter (JOB), A., ii, 83, 222.
- copper (ABEL), A., ii, 378.
- Elements**, relation between atomic weight, atomic volume, and melting point of (BAYLEY), A., ii, 497.
- Embryo**, mammalian, first appearance of aldehydase in the (JACOBY), A., ii, 670.
- Enantiotropy** of tin (COHEN), A., ii, 106, 244.
- Endotrypsin**, an enzyme from yeast (HAHN and GERET), A., i, 59 ; ii, 677 ; (KUTSCHER), A., ii, 466, 523.
- Energy**, need for, during inanition (VOIT), A., ii, 254.
- free, alteration of, during the formation of some slightly soluble metallic salts (KLEIN), A., ii, 225.
- of non-carboxylic organic acids (COFFETTI), A., i, 29.
- Enstatite** from Massachusetts (EMERSON), A., ii, 250.
- Enzymes**, physiological function of, in vegetable life (SOAVE), A., ii, 267.
- mechanism of the action of (HANRIOT), A., i, 243 ; ii, 175.

63

Enzymes, sensitiveness of, and their relation to protoplasm (BOKORNY), A., i, 177, 435; (KONING), A., i, 177.
 action of chemical agents on (BOKORNY), A., i, 437.
 influence of food on the secretion of (PORTIER and BIERRY), A., ii, 666.
 action of, on chromatophores and dissolved dyes (KONING), A., i, 177.
 in Actiniae (MESNIL), A., ii, 562.
 from *Penicillium glaucum*, inversion of raffinose by an (GILLOT), A., ii, 121.
 diffusion of, in seeds (LUMIA), A., ii, 33.
 acting on salol in various organs (NOBÉCOURT and MERKLIN), A., ii, 324.
 which produces mannitol (GAYON and DUBOURG), A., i, 784.
 amylolytic, of the liver (PERMILLEUX; DASTRE), A., ii, 325.
 soluble dehydrating, in the organism of the horse (GÉRARD), A., ii, 178.
 endo-cellular (DASTRE), A., ii, 325.
 fat-splitting, of the stomach (VOLHARD), A., ii, 518.
 glycolytic, in muscle (BRUNTON and RHODES), A., ii, 563.
 inorganic (BREDIG and IKEDA), A., ii, 441; (BREDIG and REINDERS), A., ii, 442.
 organic, action of poisons on (HÖBER), A., ii, 151.
 oxidising. See Oxydase.
 pancreatic, immunity in relation to (DEAN), A., ii, 563.
 proteolytic, in the organs and tissues of the body (HEDIN and ROWLAND), A., ii, 462.
 and rennet-like, in malt (WEIS), A., ii, 69.
 in germinated seeds (BUTKEWITSCH), A., ii, 182, 466.
 in the spleen (HEDIN and ROWLAND), A., ii, 402.
 of yeast (HAHN and GERET), A., i, 59; ii, 677; (KUTSCHER), A., ii, 466, 523.
 action of, on toxins (BALDWIN and LEVENE), A., ii, 667.

Enzymes. See also:—

Aldehydase.
 Bromelin.
 Casease.
 Catalase.
 Diastase.
 Endotrypsin.
 Galactase.
 Glucase.
 Invertase.

Enzymes. See:—

Invertin.
 Laccase.
 Lactase.
 Lipase.
 Lotase.
 Maltase.
 Maltoglucase.
 Myrosin.
 Oxydases.
 Papain.
 Papayotin.
 Pepsin.
 Peptase.
 Philothion.
 Protease.
 Ptyalin.
 Pyocyanase.
 Rennet-ferment.
 Rennin.
 Schinoxydase.
 Seminase.
 Spermas.
 Suerase.
 Taka-diastrase.
 Tannase.
 Trypsin.
 Urease.
 Zymase.

Epanorin (ZOPF), A., i, 88.

Epichlorohydrin and **Epibromohydrin**, action of, on the sodium derivatives of benzoylacetate esters (HALLER), A., i, 538.

Epidote (*bucklandite*) from Ach-Matovsk, Urals (ANTIPOFF), A., ii, 607.

Epinephrine (ABEL), A., i, 354.
 sulphate, intravenous injection of minimal doses of (HUNT), A., ii, 259.

Epithelia, transport of fluid by (REID), A., ii, 460.

Equation of condition and the theory of cyclic motion (VAN DER WAALS), A., ii, 644.

Equilibrium of mixed crystals with the vapour phase (ROOZEBOOM), A., ii, 151.

in ternary systems (SCHREINEMAKERS), A., ii, 146, 224, 305, 372, 436, 445.

in the system, acetone-phenol-water (SCHREINEMAKERS), A., ii, 445.

composition of the vapour phase of the systems aniline-water, and aniline-phenol-water (SCHREINEMAKERS), A., ii, 57.

in the system, ether-succinonitrile-water (SCHREINEMAKERS), A., ii, 641.

composition of the vapour phase in the system phenol-water, with one or two liquid phases (SCHREINEMAKERS), A., ii, 9, 57.

Equilibrium:—

Vapour phase, composition of the, of the systems aniline-water, and aniline-phenol-water (SCHREINEMAKERS), A., ii, 57.

composition of the, in the system phenol-water, with one or two liquid phases (SCHREINEMAKERS), A., ii, 9, 57.

Equivalent alteration of the distribution coefficient of ammonia between chloroform and water for the alkali salts (DAWSON and McCRAE), T., 493; P., 1901, 5.

of the distribution coefficient of ammonia between chloroform and water for the alkaline earth salts (DAWSON and McCRAE), T., 1069; P., 1901, 177.

Equivalents of the rare earths, error of the "sulphate method" for the determination of the (BRAUNER and PAVLÍČEK), P., 1901, 63.

Erbium, spectrum of (BAUR and MARC), A., ii, 634.

Erucamide (KRAFFT and TRITSCHLER), A., i, 116.

Erysimin from *Erysimum aurum* (SCHLAGDENHAUFFEN and REEB), A., i, 39.

Erythric acid. See $\alpha\beta\gamma$ -Trihydroxybutyric acid.

r-**Erythritol** (MAQUENNE and BERTRAND), A., i, 497.

i-**Erythritol** diacetal, preparation and thermochemical data of (DELÉPINE), A., i, 3.

diformal, thermochemical data of (DELÉPINE), A., i, 4.

Erythritols, active (MAQUENNE and BERTRAND), A., i, 497.

l-**Erythrose** and its phenylhydrazone, and *l*-**Erythronic acid** and its lactone (RUFF and MEUSSER), A., i, 449.

Eschscholzia californica, alkaloids of (SCHMIDT), A., i, 742; (FISCHER), A., i, 743.

Essences, fruit, analysis of (FABRIS), A., ii, 49.

Ester-formation with pyridinepolycarboxylic acids (MEYER), A., i, 750.

Esterification, new automatic method of (FRANKLAND and ASTON), T., 517; P., 1901, 41.

of amyl and methyl alcohols (McKENZIE), T., 1139; P., 1901, 186.

of glycerol (BÜTTINGER), A., i, 661.

of 3-nitrophthalic acid (McKENZIE), T., 1135; P., 1901, 186.

of 3- and 4-nitrophthalic acids (WEGSCHEIDER and LIPSCHITZ), A., i, 32;

(WEGSCHEIDER), A., i, 325.

Esterification, fractional, of stereoisomerides (MARKWALD and McKENZIE), A., i, 229.

in plants, mechanism of (CHARABOT and HÉBERT), A., ii, 619.

Esters, preparation of, from other esters of the same acid (PATTERSON and DICKINSON), T., 280; P., 1901, 4.

equilibrium between acids, alcohol, water and (EULER), A., ii, 307.

addition of, to diethyl succinate (STORBE), A., i, 147, 276.

compounds of, with complex acids (v. BAEYER and VILGELT), A., i, 659.

acid, of *as*-dicarboxylic acids, nomenclature of (SUDBOROUGH), P., 1901, 43.

alkyl, action of organometallic derivatives on (BÉHAL), A., i, 246; (MASSON), A., i, 249; (GRIGNARD), A., i, 250.

organic, action of sodium on (REFORMATSKY; ASTACHOFF and REFORMATSKY; PROTOPOFF and REFORMATSKY), A., i, 447.

Estragol, action of iodine and yellow mercuric oxide on (BOUGAULT), A., i, 383, 392.

colour reaction of (CHAPMAN), A., ii, 77.

Ethane, production of (BONE and JERDAN), T., 1042; P., 1901, 162.

bromine derivatives, preparation of (POURET), A., i, 305.

Ethanedicarboxylic acids. See:—

Methylmalonic acid (*isosuccinic acid*). Succinic acid.

Ethanol-dipropylamine, *diisobutylamine* and *diisopropylamine*. See Hydroxyethyl-dipropylamine, *diisobutylamine*, and *diisopropylamine*.

Ethanolmercuric iodide and its benzoyl derivative and **Ethanolquinolinium haloids** (SAND), A., i, 458.

Ethenyl-4-methylumbelliferone, 8-amino- (v. PECHMANN and OBERMILLER), A., i, 337.

Ethenyl trisulphide. See Tetraethenyl hexasulphide.

Ether. See Ethyl ether.

b. p. 136—146°, from $\beta\gamma$ -dimethyl- β -butylene dibromide and alcoholic potash (KONDAKOFF), A., i, 62.

$C_{78}H_{64}O_{36}N_2$, from the hydrolysis of filicitannic acid (REICH), A., i, 212.

Etherification, phenomena of (NEF), A., i, 626.

by inorganic salts (ODDO), A., i, 495.

of triphenylcarbinols by alcohols (FISCHER), A., i, 82.

Ethers, action of acid chlorides on, in presence of zinc (DESCUDÉ), A., i, 357; (FREUNDLER), A., i, 445; (WEDEKIND and HAEUSSERMANN), A., i, 536.

mixed, decomposition of, by hydrogen haloids (MICHAEL), A., i, 625.

compounds of, with complex acids (V. BAEYER and VILLIGER), A., i, 659.

Ethers. See also :—

Acetals.

Amyl ethers.

Anethole.

Anisole.

Apigenin methyl ether.

Apiole.

Benzeneazo-*o*-nitrophenyl ethyl ether.

Benzene-4-azoresorcinol methyl ether.

Benzhydrol ether.

Benzoyl-*m*-tolyl methyl ether.

2:4-Bisbenzeneazoresorcinol methyl ether.

Butaldehyde diethylacetal.

Campheride.

Catechol diethyl ether.

Catechol methylene ether.

Cærulein methyl and ethyl ethers.

Diisocamylformal.

Diamyloxydiphenylmethane.

Diazobenzenephloroglucinol methyl ether.

Di-*tri*bromo-*m*-hydroxyphenyldi-bromo-*o*-quinophenylene ether.

Diisobutyloxydiphenylmethane.

Diethoxybenzylidene.

Diethylacetal.

Diethyleneanisole.

Diethylformal.

Dihydrophenanthrene oxide.

o-Dihydroxycatechol ether.

1:5-Dihydroxy-3-methoxyxylene.

Diketo-hexamethyleneacetals.

2:6-Diketo-3:4:4-trimethylhexa-methylene ethyl ether.

Dimethylmethylal.

1:3-Dimethoxybenzene.

o-Dimethoxybenzoin methyl ether.

Dimethoxybenzylidene.

Dimethylacetal.

Dimethyloxydiphenylmethane.

Dimethylphloroglucinol benzyl and methyl ethers.

α -Dinaphthylene oxide.

Diphenylene oxide.

Dipropylformals.

Dipropyloxydiphenylmethane.

Di-*tri*phenylsilicyl ether.

i-Erythritol diacetal and diformal.

1-Ethoxybenzene.

1-Ethoxydiphenyl.

Ethoxynaphthalenes.

Ethers. See :—

Ethylene glycol acetal and formal.

Ethyl ether.

Gallamino-*p*-phenetole.

Gallein methyl and ethyl ethers.

Gallin pentamethyl ether.

Glycerol diaryl ethers.

Guaiacol.

Guaiacol ethyl ether.

Hexaethoxydiphenyl.

m-Hydroxyacetophenonemethyl ether.

2-Hydroxy-5-methylolbenzaldehyde ether.

5-Hydroxy- $\alpha\beta$ -naphthaphenazine ethyl ether.

Hydroxyquinol triethyl ether.

p-Hydroxytriphenyl methyl ether.

Lotoflavin ethers.

d-Mannitol triacetal and triformal.

Menthyl chloromethyl oxide.

Menthyl β -naphthyl methylene ether.

o-Methoxyazobenzene.

1-Methoxybenzene.

3-Methoxy-2:6-dimethylphenetriol.

1-Methoxydiphenyl.

Methoxyethoxybenzenes.

4-Methoxyhydrindene.

13-Methoxy-10-methylphenanthrazine.

Methoxyphenylethenylcyclotriazan.

p-Methoxystyrene.

8-Methoxy-2:3:5-trimethylquinoxaline.

4-Methylaphnetin dimethyl ether. Methyl ether.

3-Methyloctanone-7-al, acetal of.

Methylphloroglucinol methyl ethers.

4-Methylumbelliferone methyl ethers.

Morphenol methyl ether.

α -Naphthol methyl and ethyl ethers.

Octohydrodinaphthylene oxide.

Orcinol ethers.

Phenetole.

Phenol ethers.

β -Phenoxypropylene.

Phenyl *p*-tolyl ether.

Phloroglucinol ethers.

Propaldehyde diethylacetal.

p- ψ -Propenylanisole.

Propenylcatechol ethoxymethyl ether.

6-Propionylresorcinol ethyl ethers.

o-Quinocatechol ether.

Quinol diphenyl ether.

Resorcinol diphenyl ether.

Resorcinol ethyl ether.

Safrole.

*iso*Safrole.

Salicylaldehyde methyl ether.

Succintetramethylacetal.

p-Telluroanisole.

p-Tellurophenetole.

Tetrahydrodinaphthylene oxide.

Ethers. See:—

- Tetramethoxydiphenyltrichloroethane.
- Tetramethoxystilbene.
- 4:4'-Tetramethyl β -diaminotriphenylcarbinol ethers.
- β -Thymoxystyrene.
- Tolueneazodibromophenylethylethers.
- Tolueneazo-*o*-nitrophenol ethyl ethers.
- Tolyl methyl ethers.
- Triazoanisoles.
- Triazopyrocatechol methylene ether.
- 1:2:4-Triethoxybenzene.
- Triethoxyethylbenzene.
- 2:2':2''-Trihydroxy-1:1':1''-trinaphthylmethane *esca*anhydride, methyl and ethyl ethers of.
- Trimethylphloroglucinol ethyl ether.
- β -*m*-Xyleneoxystyrene.
- Ethoxalylacetyl-*p*-nitrobenzamidine** (RAPPEPORT), A., i, 563.
- Ethoxide**, barium, action of ethyl alcohol on (GUERBET), A., i, 625.
- sodium, action of, on fat (BULL), A., ii, 137.
- m*-Ethoxyacetophenone** (v. KOSTANECKI and TAMBOR), A., i, 558.
- β -Ethoxyacrylic acid**, α -cyano-, esters (DE BOLLEMONT), A., i, 116.
- Ethoxyaminoacetophenone** (*acetyl- p -phenetidine*) and its hydrochloride and phenylhydrazone (KUNCKELL), A., i, 214.
- Ethoxyanilinophosphoryl chloride** (CAVEN), P., 1901, 26.
- α -Ethoxyanisylidenacetophenone** (POND and SHOFFSTALL), A., i, 36.
- p*-Ethoxybenzaldehyde**, condensation of, with isobutaldehyde (HILDESHEIMER), A., i, 645.
- 1-Ethoxybenzene**, chloronitrocyano- (VAN HETEREN), A., i, 460.
- Ethoxyaronic acid**, and ethyl ester, and anhydride, formation of (PERKIN and THORPE), T., 759; P., 1900, 149.
- 7-Ethoxychromone** and its 2-carboxylic acid (v. KOSTANECKI, PAUL, and TAMBOR), A., i, 735.
- Ethoxycoumarophenazine** (MARCHELEWSKI and SOSNOWSKI), A., i, 615.
- 7-Ethoxy-2:3-dimethylchromone** (v. KOSTANECKI and LLOYD), A., i, 735.
- 1-Ethoxydiphenyl** (HÖNIGSCHMID), A., i, 700.
- Ethoxy-2-ethylchromones**, 6- and 7- (v. KOSTANECKI and TAMBOR), A., i, 558.
- 3'-Ethoxyflavone** (v. KOSTANECKI and TAMBOR), A., i, 558.
- Ethoxylutidine**, chloro-, and its salts (MICHAELIS and v. AREND), A., i, 609.
- Ethoxymethyleneacetoacetic acid**, ethyl ester, action of, on cyanoacetamide (ERRERA), A., i, 43.
- Ethoxymethylenecyanoacetic acid**. See β -Ethoxyacrylic acid, α -cyano-.
- 9-Ethoxy-10-methyl-7-phenylnaphthazonium iodide** (FISCHER and BRUHN), A., i, 417.
- 1-Ethoxynaphthalene** and its 4-sulphonic acid and its salts, esters, amide, anilide and chloride, and their nitro-derivatives (WITT and SCHNEIDER), A., i, 698.
- 2-Ethoxynaphthalene**, 1-nitro-, electrolytic reduction of (ROHDE), A., i, 136.
- 1-Ethoxynaphthalenesulphonic acetic anhydride** (WITT and SCHNEIDER), A., i, 698.
- Ethoxynaphthylidenecamphor** (HELBONNER), A., i, 600.
- α -*p*-Ethoxyphenyl- $\beta\beta$ -dimethyl- $\alpha\gamma$ -propanediol** and its diacetyl derivative (HILDESHEIMER), A., i, 645.
- o*-Ethoxyphenylethyl alcohol** (STOERMER and KAHLERT), A., i, 536.
- p*-Ethoxyphenylhydrazonocyanoacetic acid**, ethyl ester (LAX), A., i, 231.
- 5-Ethoxy-2-phenylimino-3-phenyloxidiazoline** (WHEELER and DUSTIN), A., i, 26.
- p*-Ethoxyphenylsuccinamic acid** and its alkyl derivatives (GILBODY and SPRANKLING), P., 1900, 224.
- p*-Ethoxyphenylsuccinimide** (*pyrantin*) and its alkyl derivatives, stability of (GILBODY and SPRANKLING), P., 1900, 224.
- 2-Ethoxy-5-isopropyl-1:4-benzoquinone**, 3:6-dibromo- (HOFFMANN), A., i, 474.
- Ethoxy-*p*-toluidinophosphoryl chloride** (CAVEN), P., 1901, 26.
- Ethyl *c*-acetyl and *c*-benzoyl-thio-*b*-phenyl- α -thiosemicarbazidate** (WHEELER and DUSTIN), A., i, 25.
- Ethyl alcohol**, dry, preparation of (BULL), A., ii, 138.
- specific gravity of solutions of ether, water, and (BUSNIKOFF), A., i, 306.
- boiling point curve of mixtures of water and (NOYES and WARFEL), A., ii, 594.
- reaction between hydrochloric acid and (PRICE), T., 303; P., 1900, 185.
- equilibrium between acid, ester, water and (EULER), A., ii, 307.
- influence of, as solvent, on the rotation of ethyl tartrate (PATTERSON), T., 174; P., 1900, 176.
- action of, on barium ethoxide (GUERBET), A., i, 625.

- Ethyl alcohol**, action of, on metals (MALMÉJAC), A., i, 248.
 as a stimulant of gastric secretion (RADZIKOWSKI; MARK-SCHNORF), A., ii, 401; (FROUIN and MOLINIER), A., ii, 402.
 and protein metabolism (ROSEMANN), A., ii, 668.
 value of, as a source of muscular energy (CHAUVEAU), A., ii, 176.
 production of, during the intramolecular respiration of seeds in water (GODLEWSKI and POLZENIUSZ), A., ii, 618.
 colour reaction of (GRASSINI), A., ii, 43; (DITZ), A., ii, 223.
 detection of, in milk (UHL and HENZOLD), A., ii, 425.
 estimation of, refractometrically, in beer (LING and POPE), A., ii, 628.
 estimation of water in, volumetrically (BULL), A., ii, 137.
 presence and test for zinc in (ROMAN and DELLUC), A., ii, 40.
- Ethyl alcohol**, β -amino- (HENRY), A., i, 68.
 nitroamino-, and its salts (FRANCHIMONT and LUBLIN), A., i, 674.
- Ethyl benzoyl carbonate** (KNOLL & Co.), A., i, 703.
 chlorocarbonate, reactions of (WHEELER and DUSTIN), A., i, 26.
 cinnamyl carbonate (KNOLL & Co.), A., i, 703.
c:*b*-diphenyl- α -thiol- and -thion-semicarbazide (WHEELER and DUSTIN), A., i, 26.
- Ethyl ether**, specific gravity of solutions of alcohol, water, and (BUSNIKOFF), A., i, 306.
 vapour tensions of mixtures of chloroform and (KOHNSTAMM and VAN DALFSEN), A., ii, 641.
 isochores of, from 1 to 1.85 c.c. (MACK), A., ii, 438.
 equilibrium in the system, water, succinonitrile and (SCHREINEMAKERS), A., ii, 641.
 action of acetic chloride on (DESCIÉ), A., i, 357.
 action of benzoic chloride on (WEDEKIND and HAEUSSERMANN), A., i, 536.
 supposed compound of, with hydrogen chloride (JÜTTNER), A., ii, 595.
 compound of, with triphenylmethyl (GOMBERG), A., i, 638.
 mercuric and mono- and di-quinolinium iodides (SAND), A., i, 458.
 action of, on plants (FISCHER), A., ii, 335.
- Ethyl ether**, physiological action of (WRIGHT), A., ii, 180, 408.
 detection of alcohol in (GRASSINI), A., ii, 44.
- Ethyl ether**, diiodo-, constitution of, and action of ammonia on (SAND), A., i, 741.
- Ethyl hydroperoxide** and its salts (v. BAEYER and VILLIGER), A., i, 308.
 iodide and dry silver oxide, action of, on benzoylacetic ester, deoxybenzoin, and benzyl cyanide (LANDER), P., 1901, 59.
 action of, on silver nitrate (v. BIRON), A., i, 111.
 mercaptan and sulphide, thermochemistry of (BERTHELOT), A., ii, 146.
 action of, on quinone (TARBOURIECH), A., i, 329.
 nitrate, preparation of and hydrolysis of, by water (v. BIRON), A., i, 111.
 peroxide (v. BAEYER and VILLIGER), A., i, 62.
 salicyl carbonates (KNOLL & Co.), A., i, 703.
- hydrogen sulphate**, action of heat on (RAMSAY and RUDORF), P., 1900, 177.
 potassium and rubidium sulphates, salts of, with hydrogen fluoride (WEINLAND and KAPPELLER), A., i, 309.
 dithiocarbonate, action of diamylamine and of dimethylamine on (WHEELER and DUSTIN), A., i, 25.
 thiocarbonate diphenylsemicarbazone (WHEELER and DUSTIN), A., i, 26.
 valeryl carbonate (KNOLL & Co.), A., i, 703.
- Ethyl-acetaldoxime** and -*iso*acetaldoxime, and the hydrolysis and reduction of the *iso*-compound (DUNSTAN and GOULDING), T., 636; P., 1901, 84.
- Ethylacetonedicarboxylic acid**, cyano-, ethyl ester, action of ammonia on (DERÔME), A., i, 313.
- Ethyl-acetophenoxime** and -*iso*acetophenoxime, and the hydrolysis and reduction of the *iso*-compound (DUNSTAN and GOULDING), T., 638; P., 1901, 85.
- Ethyl-acetoxime** and -*iso*acetoxime and the hydrolysis and reduction of the *iso*-compound (DUNSTAN and GOULDING), T., 633; P., 1901, 84.
- Ethylacetylacetone**, action of, on diazochlorides (FAVREL), A., i, 167.
- Ethylacetylene**. See Butinene.

- α*-Ethyladipic acid** (*hexanedicarboxylic acid*), preparation and dissociation constants of (MELLOR), T., 130; P., 1900, 215.
- m*-Ethylaminobenzenesulphonic acid** and its isomeride and their salts and ***m*-Ethylaminoazobenzenesulphonic acid** (GNEHM and SCHEUTZ), A., i, 519.
- o*-Ethylaminobenzoic acid**, methyl ester (VORLÄNDER), A., i, 463.
- m*-Ethylaminophenol** and its phthalein (GNEHM and SCHEUTZ), A., i, 520.
- 4-Ethylaminophenyl-*α*-cyanoazo-methine-phenyl and -4'-nitro-phenyl** (SACHS and BRV), A., i, 229.
- p*-Ethylaminophenylglyoxylic acid** (BOEHRINGER & SONS), A., i, 713.
- p*-Ethylamino-*m*-tolylglyoxylic acid** (BOEHRINGER & SONS), A., i, 714.
- α*-Ethylanthracetonebenzil** (JAPP and MELDRUM), T., 1038; P., 1901, 175.
- Ethylaniline**, compound of, with silver nitrate (TOMBECK), A., i, 135.
- Ethylanthranilic acid** (MEYER), A., i, 191.
- Ethylbenzene**, *α*-thiocyano- (WHEELER and JOHNSON), A., i, 707.
- β*-Ethylsec. butyl-hydroxylamine** and -sulphamic acid (MAMLOCK and WOLFFENSTEIN), A., i, 673.
- Ethylisocarbamide** and its salts (MCKEE), A., i, 757.
- Ethylcarbimide** (*ethyl isocyanate*), absorption spectra of (HARTLEY, DOBBIE, and LAUDER), T., 856; P., 1901, 125.
- l*-Ethyleonine** and its salts (HOHENEMSER and WOLFFENSTEIN), A., i, 606.
- β*-Ethyl-*α*-dimethyl- and -*α*-diethylbutyric acids**, *dithio*-, ethyl esters (POSNER and EBERS), A., i, 705.
- Ethylene**, laboratory method for the preparation of (NEWTN), T., 915; P., 1901, 147.
- comparison of the solubility of acetylene and (TUCKER and MOODY), A., ii, 696.
- inhalation of (SMITH and HOSKINS), A., ii, 464.
- derivatives (HENRY), A., i, 577.
- compounds of, with mercuric haloids, constitution of (SAND), A., i, 458.
- Ethylene dibromide**, action of, on *ψ*-cumidine and xylydine (SENIER and GOODWIN), T., 254; P., 1900, 228.
- action of sodium ethoxide on, under pressure (MACKENZIE), T., 1221; P., 1901, 150.
- ethyl alcohol. See Trimethylene-carbinol.
- Ethylene glycol**, specific heat and latent heat of fusion of (DE FORCRAND), A., ii, 224.
- heat of vaporisation and hydration of (DE FORCRAND), A., i, 307.
- acetal and formal, thermochemical data of (DELÉPINE), A., i, 4.
- Ethylene oxide**, compound of, with ferrocyanic acid (v. BAEYER and VILLIGER), A., i, 659.
- Ethylene-*p*-diaminodiphenylglyoxylic acid** (BOEHRINGER & SONS), A., i, 714.
- Ethylenediamine** platinochloride (JØRGENSEN), A., i, 164.
- Ethylenedicarbamilide**. See Dicarbanil-inodiphenylethylenediamine.
- Ethylenedicarboxylic acid**. See Fumaric acid.
- Ethylenetetra-carboxylic acid**, ethyl and methyl esters (WEDEKIND), A., i, 504.
- α*-Ethylglutaric acid** (*pentanedicarboxylic acid*), preparation and dissociation constants of (MELLOR), T., 126; P., 1900, 215.
- Ethylcyclohexane** (SABATIER and SENDERENS), A., i, 459.
- synthesis of (SABATIER and SENDERENS), A., i, 263.
- γ*-Ethyl-*β*-hexene**. See Octylene.
- Ethylhydroxyethylamine**, picrolonates of (MATTHES), A., i, 259.
- Ethylideneacetone**, bromo-, and dibromide (PAULY and v. BERG), A., i, 506.
- Ethylidenedi-*o*-aminodibenzoic acid**, methyl ester (MEHNER), A., i, 471.
- Ethylideneaminophenylguanidine** nitrate (PELLIZZARI and RONCAGLIOLI), A., i, 768.
- Ethylideneaniline**, Eckstein's, constitution of, and its stereoisomeride, salts, and diacetyl derivative (EIBNER), A., i, 640.
- hydrogen and sodium sulphites, and trichloro- (EIBNER), A., i, 376.
- Ethylidenebenzylamine** (HANTZSCH and SCHWAB), A., i, 380.
- Ethylidenebisacetoacetic acid**, ethyl ester, phenylhydrazone of (RABE and BILLMANN), A., i, 164.
- Ethylidenebistetric acid** (WOLFF and SCHIMPF), A., i, 284.
- Ethylidenedianiline** hydrogen sulphite, hydrated, trichloro- (EIBNER), A., i, 377.
- l*-Ethylidenelactic acid**. See Lactic acid.
- Ethylidene-*o*-toluidine** and its isomeride, and their acetyl, benzoyl, and dinitroso-derivatives and salts (EIBNER and PELTZER), A., i, 97.

- 2-Ethyl-4-ketodihydroquinazoline** (GOTTHELF), A., i, 764.
- Ethylmalonic acid** (*propanedicarboxylic acid*), ethyl ester, action of ethyl citraconate and fumarate on (MICHAEL), A., i, 123.
- cyano-, ethyl ester (HALLER and BLANC), A., i, 261.
- Ethylmenthane** (KURSANOFF), A., i, 554.
- 1-Ethyl- α - and 3-Ethyl- β -naphthiminazole** and their salts (FISCHER, FEZER, and REINDL), A., i, 413.
- Ethylxalyl-o-aminoacetophenone** (CAMPS), A., i, 751.
- Ethylpentanetricarboxylic acid**, ethyl ester (MELLOR), T., 132.
- p*-**Ethylphenol**, *tri*- and *tetra*-bromo-, and their ψ -quinols and acetyl derivatives (ZINCKE), A., i, 204.
- p*-**Ethylphenyl-acetylene** and -chloro-acetylene (KUNCKELL and KORITZKY), A., i, 75.
- α -**Ethylpimelic acid**, preparation of (MELLOR), T., 131; P., 1900, 215.
- 2-Ethylpiperidine** and its salts, properties of (LIPP), A., i, 162.
- d*- and *l*-, physical constants of (FRESE), A., i, 163.
- $\beta\beta$ -Ethylpropylglutaric acid** (*octanedicarboxylic acid*) (GUARESCHI and PEANO), A., i, 631.
- 4-Ethyl-4-propyltrimethylenedicarbonimide**, 3:5-*di*-cyano- (GUARESCHI and BALDI), A., i, 345.
- 3-Ethylpyrazolone-1-carboxylamide** (BLAISE), A., i, 363.
- Ethyl-*p*-quinol** and -quinone, *tri*bromo- (ZINCKE), A., i, 204.
- 1-Ethyl-2-quinolone**, nitro-derivatives of (DECKER), A., i, 654.
- 5-Ethyl-2-stilbazole**, 3'- and 4'-nitro-, and their salts (BACH), A., i, 610.
- p*-**Ethylstyrene**, *o**B*-*dichloro*- (KUNCKELL and KORITZKY), A., i, 75.
- β -**Ethylsuccinic acid** (*butanedicarboxylic acid*), α -cyano-, ethyl ester (JOWETT), T., 1347; P., 1901, 199.
- Ethylthioncarbanilic acid**, methyl ester, and its conversion to the thiol derivative (WHEELER and DUSTIN), A., i, 24.
- α -**Ethyltricarballic acid**, formation of (JOWETT), T., 1343; P., 1901, 199.
- synthesis of, and its triethyl ester, salts, anhydro-acid, and β -cyano-derivative (JOWETT), T., 1346; P., 1901, 199.
- Ethyltricarbimide** (*ethyl isocyanurate*), absorption spectra of (HARTLEY, DOBBIE, and LATPHER), T., 860; P., 1901, 125.
- 3-Ethylxanthine** (BOEHRINGER & SONS), A., i, 770.
- 1:3:5-Ethylxyldine**, 2-nitroso- (FISCHER and CAMMERLOHER), A., i, 418.
- Eucalyptus oil** (SCHIMMEL & Co.), A., i, 395.
- containing 60 per cent. of geranyl acetate (SMITH), A., i, 282.
- Eugenol** and *iso***Eugenol**, colour reactions of (CHAPMAN), A., ii, 76.
- Eugenoxacetic acid** (*eugenolglycollic acid*) and its salts, esters, and derivatives (CLAUSER), A., i, 388.
- Eugenoxylfumaric acid** and its ethyl ester (RUHEMANN and WRAGG), T., 1186; P., 1901, 187.
- 2-*m*-Eugenoxymethyl-5-methyl- and -5-ethoxy-benziminazoles** and their salts (COHN), A., i, 353.
- Eugenyl potassium sulphate** (VERLEY), A., i, 143.
- 1-Eugenylloxymethylbenzoxazole** (COHN), A., i, 752.
- Enpitone** (*hexamethoxyaurin*) and its derivatives (LIEBERMANN and WIEDERMANN; LIEBERMANN), A., i, 384.
- Eupitone black** (*hexahydroxyaurin*) and its hydrochloride (LIEBERMANN and WIEDERMANN), A., i, 384.
- Europium** (DEMARÇAY), A., ii, 511.
- Eutectic curves** in systems of three substances of which two are optical antipodes (ADRIANI), A., ii, 230.
- Euxanthic acid** and anhydride, and their salts, esters, and acetyl and benzoyl derivatives (GRAEBE), A., i, 85.
- Euxenite** from Brevig, new substances in (HOFMANN and PRANDTL), A., ii, 387.
- Evernuric acid** (HESSE), A., i, 595.
- Exalgin** (*methylacetanilide*), colour reaction of, with potassium permanganate (MAAS), A., ii, 210.
- Expansion**, relation between melting point and, of metals (LÉMERAY), A., ii, 145.
- of aqueous sucrose solutions (DOMKE, HARTING, and PLATO), A., i, 189.
- Explosion** of mixtures of combustible vapours or fumes and air (KUBERSCHIKY), A., ii, 232.
- Explosives**, new (ALVISI), A., ii, 498.
- analysis of (SMITH), A., ii, 699.
- containing nitroglycerol, estimation of foreign volatile components of (DUPRÉ), A., ii, 582.
- Extraction apparatus** for solutions by means of liquids of lower specific gravity (NEUFELD), A., ii, 152.

F.

Fæces, use of pepsin solution for investigating (PFEIFFER and LEMMER-MANN), A., ii, 189.

detection of peptone in (FREUND), A., ii, 710.

human, estimation of carbohydrates in (STRASBURGER), A., ii, 357.

estimation of fat in (OEFELE), A., ii, 78; (LÜHRIG), A., ii, 208.

Farmyard manure. See Agricultural Chemistry.

Fassaite from Syria (FINCKH), A., ii, 172.

Fat, composition of, in the organism (HENRIQUES and HANSEN), A., ii, 405.

formation and decomposition of, in the tissues (HESTER), A., ii, 461.

determination of the specific heats of (VANDEVYVER-GRAU), A., ii, 46.

mean molecular weight of the fixed (insoluble) acids of (TORTELLI and PERGANI), A., ii, 358.

action of sodium ethoxide on (BULL), A., ii, 137.

absorption of (PFLÜGER), A., ii, 29, 562; (MUNK), A., ii, 176; (ROSENBERG), A., ii, 403.

artificially coloured, absorption of (HOFBAUER; EXNER; PFLÜGER), A., ii, 403.

sugar formation from (HARTOGH and SCHUMM), A., ii, 176.

combination of, with proteid (NERKING), A., i, 491.

dyes for (MICHAELIS), A., i, 489.

of human blood (ENGELHARDT), A., ii, 665.

of *Stillingia sebifera* seeds (TORTELLI and RUGGERI), A., ii, 34.

hydrolysis and decomposition of, in the soil (RUBNER), A., ii, 273.

examination of (REYCHLER), A., ii, 208.

optical examination of (MARPMANN), A., ii, 431.

analysis of (HALPHEN), A., ii, 359.

absolute iodine absorption number of (TORTELLI and RUGGERI), A., ii, 47.

determination of the saponification number of (SCHMATOLLA), A., ii, 630.

apparatus for estimating (JERWITZ; WHEELER and HARTWELL), A., ii, 586.

amount and estimation of, in blood (BÖNNINGER), A., ii, 325.

apparatus for the simultaneous estimation of water and, in butter (PODA), A., ii, 482.

Fat, refraction and iodine number of, in butter (HOLM, KRARUP, and PETERSEN), A., ii, 291.

estimation of, in finely powdered substances, particularly in cocoa and cocoa mixtures (WELMANS), A., ii, 47.

estimation of, in cream (ECKLES), A., ii, 137; (DEULHOLM), A., ii, 359.

estimation of, in fæces (OEFELE), A., ii, 78; (LÜHRIG), A., ii, 208.

estimation of, in fodders (JAHN), A., ii, 431.

estimation of, in milk by means of anhydrous sodium sulphate (LE COMTE), A., ii, 359.

estimation of glycerol in (BULL), A., ii, 138.

elimination and estimation of water in (DAVIS), A., ii, 629.

Fats. See also :—
Butter.

Lard.

Margarine.

Milk.

Fatty compounds, configuration of (PETRENKO-KRITSCHENKO), A., i, 1.

combination of, with glycuronic acid (NEUBAUER), A., ii, 614.

Fatty series, direct nitration in the (BOUVEAULT and WAHL), A., i, 4, 5;

(WAHL), A., i, 310, 445.

Feeding, forced, metabolism in (WHITE and SPRIGGS), A., ii, 28, 253.

Felspar from Christiania district (BRÖGGER), A., ii, 169.

from Point Sal, California (FAIRBANKS), A., ii, 168.

Felspars, glaucescence of (VIOLA), A., ii, 320.

Fenchene and **Fenchyl iodide** (KONDAKOFF and LUTSCHININ), A., i, 282.

Fenchenes, isomeric, and their reactions (WALLACH and NEUMANN), A., i, 332.

Fenchocamphorones, isomeric, and their reactions (WALLACH and NEUMANN), A., i, 333.

Fencholenic acids, isomeric, and their amides (WALLACH and v. WESTPHALEN), A., i, 332.

Fenchone, biological oxidation of (RIMINI), A., i, 393.

broiuro- (BALBIANO), A., i, 89.

Fenchone series, compounds of the (WALLACH), A., i, 331.

Fennel oil, French bitter (SCHIMMEL & Co.), A., i, 394.

Fermentation, physics of (PRIOR and SCHULZE), A., ii, 262.

influence of carbon dioxide on (ORTLOFF), A., ii, 262.

of pentoses (SCHÖNE and TOLLENS), A., i, 367.

- Fermentation** of sugars by *Bacillus coli communis* and allied organisms (HARDEN), T., 610; P., 1901, 57; A., ii, 410, 567.
 with yeasts and sugars (LINDNER), A., ii, 182, 263.
 produced by yeasts, influence of oxygen on (IWANOWSKI and OBRASTZOFF), A., ii, 568.
 alcoholic, without yeast cells (BUCHNER and RAPP), A., ii, 465.
 selection of carbohydrates by different yeasts during (KNECHT), A., ii, 568.
 auto-, of yeast (KUTSCHER), A., ii, 466.
 of pressed yeast (HARDEN and ROWLAND), T., 1227; P., 1901, 189.
 lactic acid, and its practical use (EPSTEIN), A., ii, 119; (CHODAT and HOFMAN-BANG), A., ii, 264.
- Ferments.** See Enzymes and Yeast.
- Ferric acid**, soluble alkali salts of (HABER and PICK), A., ii, 103; (PICK), A., ii, 554.
- Ferric compounds.** See under Iron.
- Ferricyanic acid**, compounds of, with alcohols, aldehydes, esters, ethers and ketones (v. BAEYER and VILIGER), A., i, 659.
- Ferrisalicylic acid** as an indicator (GEROCK), A., ii, 190.
 sodium salt (WOLFF), A., ii, 346.
- Ferrochrome**, estimation of carbon in (BLAIR), A., ii, 74.
 estimation of manganese in (T.), A., ii, 283.
- Ferrocyanic acid**, compounds of, with alcohols, aldehydes, esters, ethers, ethylene oxide and ketones (v. BAEYER and VILIGER), A., i, 659.
- Ferro-manganese**, estimation of manganese in (NORRIS), A., ii, 579.
- Ferro-silicons**, constituents of (LEBEAU; JOUVE), A., ii, 317.
 analysis of (IBBOTSON and BREARLEY), A., ii, 199.
 estimation of calcium in (GRAY), A., ii, 578.
- Ferrous compounds.** See under Iron.
- "Ferrum oxydatum saccharatum,"** estimation of iron in (GÖNLIICH), A., ii, 132.
- Fertilisers**, automatic filter-washer for use in the analysis of (PICKEL), A., ii, 685.
 estimation of the availability of organic nitrogen in (STREET), A., ii, 531.
 See also Agricultural Chemistry.
- Fevers**, composition of the blood in (v. STEJSKAL), A., ii, 404.
- Fibrin**, action of trypsin on (VERNON), A., i, 576.
- Fibrinolysis** (CAMUS), A., ii, 256.
- Fibroin** from silk, hydrolysis of (FISCHER and SKITA), A., i, 783.
- Ficoceroic acid** and **Ficocerylic alcohol** (GRESIOFF and SACK), A., i, 416.
- Filicitannic acid** and its salts and bromo- and benzoyl derivatives (REICH), A., i, 212.
- Filter-washer**, automatic (PICKEL), A., ii, 685.
- Fish**, smallest amount of oxygen in water necessary to (KÖNIG and HÜNNEMEIER), A., ii, 457.
 minimum quantity of oxygen required by, and poisonous quantities of carbon dioxide (KUPZIS), A., ii, 665.
 toxic action of electrolytes on (KAHLENBERG and MEHL), A., ii, 327.
 selachian, gastric digestion in (WEINLAND), A., ii, 252, 458.
- Fish meal.** See Agricultural Chemistry.
- Fish-sperm**, histon from (EURSTRÖM), A., ii, 401.
- Flavinduline chloride**, 11-chloro-, and its interaction with bases (KEHRMANN and HIEB), A., i, 418.
- Flavindulines**, amino- and nitro- (KEHRMANN and EICHLER), A., i, 421.
- Flesh**, nutritive value of (FRENTZEL and SCHREUER), A., ii, 609.
- Flour testing** (ZEGA), A., ii, 533.
- Fluorene**, potassium derivative of (WEISSGERBER), A., i, 521.
 derivatives (DIELS), A., i, 521.
- Fluorene alcohol**, 2-amino-, and its salts (DIELS), A., i, 523.
- Fluorenone**, 2-nitro-, and 2-amino- and its salts (DIELS), A., i, 522.
- Fluorescein** and its substituted derivatives, sensitiveness of, to light (GROS), A., ii, 433.
 and its methyl and ethyl esters, and the acetyl derivative of the ethyl ester (FEUERSTEIN and DUTOIT), A., i, 723.
 disulphide (BLANKSMA), A., i, 461.
- Fluorescence**, apparatus for the observation of (TSVET), A., ii, 298.
- Fluorindine** (KEHRMANN and GUGGENHEIM), A., i, 421.
- Fluorine**:—
Hydrofluoric acid (*hydrogen fluoride*), addition of, to salts of ethylsulphuric acid and some sulphonic acids (WEINLAND and KAPPELLER), A., i, 309.
Fluorides of heavy metals in solution, behaviour of (JAEGER), A., ii, 386.
Hydrofluosilicic acid, action of, on potassium ferrieyanide (MATUSCHEK), A., i, 454.

Fluorine:—

Hydrofluosilicic acid, action of, on potassium ferrocyanide (MATUSCHEK), A., i, 262.

Fluorine, detection and estimation of:—

detection of, in basic slags, bone meal, superphosphates and animal charcoal (V. LORENZ), A., ii, 193.

estimation of (HARKER), A., ii, 320.

estimation of, in zinc blendes (BULLHEIMER), A., ii, 191.

2-Fluorylhydrazine and its salts (DIELS), A., i, 522.

Fodder, decomposition of, by micro-organisms (KÖNIG, SPIECKERMANN, and BREMER), A., ii, 676.

analysis of (BROWNE and BEISTLE), A., ii, 481.

estimation of fat in (JAHN), A., ii, 431.

estimation of proteids in (SCHJERNING), A., ii, 79.

Fodder fats, estimation of the acidity of (LOGES and MÜHLE), A., ii, 702.

Fœtus, human, mineral composition of the (HUGOUNENQ), A., ii, 405.

Food, digestion of, by man (ATWATER and BENEDICT), A., ii, 253.

influence of, on muscular work (HEINEMANN), A., ii, 254.

detection of arsenic in (THOMSON and SHENTON), A., ii, 345.

test for boric acid in, with turmeric paper (JENKINS and OGDEN), A., ii, 346.

detection and estimation of salicylic acid in (PELLET), A., ii, 701.

estimation of boric acid in (LÜHRIG), A., ii, 280.

Formaldehyde, solid, preparation and melting point of (HARRIES), A., i, 254.

as a product of the incomplete combustion of carbon compounds (MULLIKEN, BROWN, and FRENCH), A., i, 188.

condensation of, with amines (GOLDSCHMIDT), A., i, 652.

action of a solution of, on calcium carbide (VANINO), A., i, 125.

action of, on *p*-formylphenetidine (GOLDSCHMIDT), A., i, 322.

aqueous, behaviour of, towards gun-cotton (VANINO), A., i, 372.

action of, on hydroxy-acids and sugars (ALBERDA VAN EKENSTEIN), A., i, 120.

condensation of, with indigo-white (BADISCHE ANILIN- and SODA-FABRIK), A., i, 715.

action of, on menthol (WEDEKIND), A., i, 393.

Formaldehyde, action of, on methyl anthranilate (MEHNER), A., i, 470; (ERDMANN), A., i, 536, 591.

condensation of, with propaldehyde (KOCH and ZERNER), A., i, 633.

use of, for the synthesis of aromatic alcohols (STOERMER and BEHN), A., i, 726.

action of, on germination (WINDISCH), A., ii, 466.

influence of, on metabolism in children (TUNNICLIFFE and ROSENHEIM), A., ii, 517.

detection of, in milk (RIEGLER), A., ii, 206; (LUEBERT), A., ii, 703.

estimation of (CRAIG; PEŠKA; BLANK and FINKENBEINER), A., ii, 703.

estimation of, gasometrically (RIEGLER), A., ii, 360.

estimation of, in milk (LIVERSEEGE), A., ii, 483.

Metaformaldehyde. See Trioxymethylene.

Paraformaldehyde, action of acid chlorides on (HENRY), A., i, 581.

Formaldehydephenylhydrazone, cyano-, and its nitroso-compound (BERTINI), A., i, 776.

α -nitro-, and its isomeride (BAMBERGER and SCHMIDT), A., i, 565.

nitro-, isomeric, and methyl ethers from them, and phenylmethylhydrazidine (BAMBERGER and SCHMIDT), A., i, 291.

Formalinsulphuric acid as a test for alkaloids (WIRTHLE), A., ii, 363; (ELIAS), A., ii, 630.

Formazyl methyl ketone (BAMBERGER and DE GRUYTER), A., i, 778.

Formic acid, chemical energy of (CAZENEUVE), A., ii, 379.

action of *Bacillus coli communis* on (PAKES and JOLLYMAN), T., 387; P., 1901, 29; (HARDEN), T., 624; P., 1901, 58.

bacterial decomposition of (PAKES and JOLLYMAN), T., 386; P., 1901, 29.

bacterial oxidation of, by nitrates (PAKES and JOLLYMAN), T., 459; P., 1901, 39.

Formic acid, amyl ester, action of, on ethyl crotonate (LAPWORTH), T., 1282.

action of, on ethyl sodiocyanoacetate (DE BOLLEMONT), A., i, 116.

Orthoformic acid, ethyl or methyl ester, action of, on alkyl cyanoacetates (DE BOLLEMONT), A., i, 116, 117.

Formylacetic acid, esters, reactions of sodium derivatives of (WISLICENUS and BINDEMANN), A., i, 361.

- Formyl-*o*-aminoacetophenone** (CAMPS), A., i, 751.
- o*-Formylaminobenzoic acid**, methyl and ethyl esters (MEHNER), A., i, 645.
ethyl ester. See also Benzoylformic acid, *o*-amino-, ethyl ester.
- Formyl-*o*-aminophenylpropionic acid** and its ethyl ester (CAMPS), A., i, 751.
- Formylglutaconic acid**, methyl and ethyl esters and their isomerides (WISLICENUS and BINDEMANN), A., i, 361.
- Formylhexamethoxydimethyl-leucaniline** (LIEBERMANN and WIEDERMANN), A., i, 384.
- p*-Formylphenetidine**, action of formaldehyde on (GOLDSCHMIDT), A., i, 322.
- Formylpropionic acid**, ethyl ester, isomeric *p*-nitrobenzoates of (WISLICENUS and WOLFF), A., i, 500.
- Formyl-*o*-tolylglycine** (VORLÄNDER and MUMME), A., i, 463.
- Forsterite** from Lathium (ZAMBONINI), A., ii, 396.
- Fractional distillation**, experiments on (YOUNG), A., ii, 86.
in a vacuum with Hempel's dephlegmator (HIRSCHEL), A., ii, 87.
- Frangula**, glucosides in (AWENG), A., i, 39.
- Freezing point** of solutions which are not very dilute, determination of the lowering of the (SMITS), A., ii, 304, 436.
of aqueous solutions of non-electrolytes (LOOMIS), A., ii, 492.
- Freezing point curves** of alloys of copper and gold and copper and silver (ROBERTS-AUSTEN and ROSE), A., ii, 25.
of isomorphous compounds (BRUNI and GORNT), A., ii, 150.
- Freezing point depressions** in aqueous solutions of electrolytes (MAC-GREGOR), A., ii, 223.
diagram of, for electrolytes (MAC-GREGOR), A., ii, 8.
in solutions containing hydrochloric and sulphuric acids (BARNES), A., ii, 304.
- Freezing point.** See also Cryoscopy.
- Friedel and Crafts' reaction** (BOESEKEN), A., i, 474.
- d*-Fructose.** See Lævulose.
- Fruit juices**, composition of, used in preparing confectionery, syrups, &c. (TRUCHON and MARTIN-CLAUDE), A., ii, 363.
analyses of (SPAETH), A., ii, 294.
- Fruits**, presence of methyl alcohol in the fermented juice of (WOLFF), A., i, 110.
- Fruits**, quantity of pentosans in (WITTMANN), A., ii, 414.
- Fuel**, chemical and calorimetric analysis of (LANGBEIN), A., ii, 128.
determination of the calorific power of (REBUFFAT), A., ii, 373.
Berthier's method for determining the calorific value of (ANTONY and DI NOLA), A., ii, 6.
See also Coal.
- "Fugacity"** (LEWIS), A., ii, 10, 639.
- Fulminic acid**, salts, preparation of (ANGELICO), A., i, 516.
mercury salt, synthetical application of (SCHOLL and BERTSCH), A., i, 465.
action of, on dimethylaniline (SCHOLL and BERTSCH), A., i, 523.
- Fumaric acid** (*ethylenedicarboxylic acid*), synthesis of, from glyoxylic and malonic acids (DOEBNER), A., i, 188.
production of, from maleic acid (SCHMIDT), A., i, 63.
action of ethyl methylmalonate and ethylmalonate on (MICHAEL), A., i, 123.
- Fumaric acid**, chloro-, ethyl ester, action of, on carvacrol and on thymol (RUHEMANN), T., 919; P., 1901, 155.
action of, on the sodium derivatives of eugenol and *m*-xylenol (RUHEMANN and WRAGG), T., 1186; P., 1901, 187.
- Fungi**, physiological action of three poisonous (CARTER), A., ii, 409.
- Funnels**, new dropping and separating (RAIKOW), A., ii, 91.
- Furfuraldehyde**, condensation of, with succinic acid (FICHTER and SCHEUERMANN), A., i, 479.
nitrotolylhydrazone (POPE and HIRD), T., 1143; P., 1901, 186.
- Furfuran**, *dibromo-* and *diiodo-* (PHELPS and HALE), A., i, 555.
nitro- (MARQUIS), A., i, 222.
- Furfuran-2:4-dicarboxylic acid** and its methyl ester and salts (FEIST), A., i, 557.
- 2-Furfurylisoamylcarbinol** and its acetate (GRIGNARD), A., i, 680.
- α -Furfurylcarbinyl- β -furfurylidene-propionic acid** (FICHTER and SCHEUERMANN), A., i, 480.
- Furfurylideneaminophenylguanidine** nitrate, picrate, and platinumchloride (PELLIZZARI and RICKARDS), A., i, 769.
- Furfurylidenebarbituric acid** (CONRAD and REINBACH), A., i, 411.
- Furfurylidenefluorylhydrazine** (DIELS), A., i, 522.

Furfurylidenesuccinic acid and its salts (FICHTER and SCHEUERMANN), A., i, 479.

Furnace, electric. See under Electro-chemistry.
small laboratory (BRUNO), A., ii, 152.

Furnaces, phenomena of combustion in (BOUDOUARD), A., ii, 651.

Fusel oil, separation of the amyl alcohols in (MARKWALD; MARKWALD and MCKENZIE), A., i, 248.

G.

Gadolinium, spectrum of (DEMARÇAY), A., ii, 102.

Galactase, distribution of, in different milks (BABCOCK, RUSSELL, and VIVIAN), A., ii, 406.

properties of (BABCOCK, RUSSELL, and VIVIAN), A., i, 437.

Galactosamine (SCHULZ and DITTHORN), A., i, 507.

Galactose from cerebrin (SCHULZ and DITTHORN), A., i, 554.

from xanthorhammin (VOTOČEK and FRIČ), A., i, 161.

derivatives of (KOENIGS and KNORR), A., i, 369; (COLLEY), A., i, 671.

d-**Galactose**, action of *Bacillus coli communis* on (HARDEN), T., 624; P., 1901, 58.

Galangin, methyl and diacetyl derivatives of, and the dibromide of the diacetyl compound (TESTONI), A., i, 92.

Galena, estimation of lead in (WILLENZ), A., ii, 196.

Gallamide, and *mono*- and *di*-bromo- and their acetyl derivatives (GNEHM and GANSSER), A., i, 326.

Gallamino-phenyl ethers, and *p*-phenetole and its tribromo- and triacetyl derivatives (GNEHM and GANSSER), A., i, 326.

Gallein, constitution of, and its methyl ester, salts, methyl and ethyl ethers, acetyl and benzoyl derivatives, and triphenylcarbamate (ORNDORFF and BREWER), A., i, 724.

Gallic acid, detection and estimation of, in tanning materials (SPICA), A., ii, 708.

chloro-, methyl and ethyl esters (MAZZARA and GUARNIERI), A., i, 722.

dichloro-, ethyl ester (MAZZARA and GUARNIERI), A., i, 594.

Gallin tetra-acetate and pentamethyl ether (ORNDORFF and BREWER), A., i, 724.

α **Gallonnaphthylamine** (GNEHM and GANSSER), A., i, 327.

Gallotannin, constitution of (POTTEVIN), A., i, 335.

Ganglion, upper cervical, effect of temperature on the activity of the (EVE), A., ii, 178.

Garnet from the Fichtelgebirge (DÜLL), A., ii, 113.

from the Tatra Mountains (GORAZDOWSKI), A., ii, 170.

Gas, measurement of the evolution of a (JOB), A., ii, 83.

electrolytic, catalysis of, by colloidal platinum (ERNST), A., ii, 495.

illuminating, estimation of hydrogen sulphide in (TITWILLER), A., ii, 421.

Gas analysis apparatus (SAMOILOFF and JUDIN), A., ii, 621.

Gas pressure, law of, between 1.5 and 0.01 mm. of mercury (RAYLEIGH), A., ii, 542.

Gas purifying material, spent, estimation of Prussian blue in (NAUSS), A., ii, 43.

Gases under the influence of cathode rays, electrical conductivity of (McLENNAN), A., ii, 490.

conductivity produced in, by the motion of negatively charged ions (TOWNSEND), A., ii, 221; (TOWNSEND and KIRKBY), A., ii, 434.

dielectric constant of some, and its dependence on temperature (BÄDEKER), A., ii, 220.

liquefaction of a mixture of two (DUHEM), A., ii, 227.

liquefied, under atmospheric pressure, apparatus to determine magnetic rotation in (SIERTSEMA), A., ii, 5.

solubility of, in organic solvents (JUST), A., ii, 439.

solubility of, in water (WINKLER), A., ii, 446.

distinction between chemical and physical supersaturation of liquids by (BERTHELOT), A., ii, 8.

viscosity of, as affected by temperature (RAYLEIGH), A., ii, 9.

combustion of (TANATAR), A., ii, 13, 228.

atmospheric, spectroscopic notes concerning the (RAYLEIGH), A., ii, 141.

spectrum of the more volatile, which are not condensed at the temperature of liquid hydrogen (LIVING and DEWAR), A., ii, 213.

combustible, of the atmosphere (GAUTIER), A., ii, 14, 92, 171, 232.

- Gases** produced by Bacteria, apparatus for the collection and examination of (PAKES and JOLLYMAN), T., 322; P., 1900, 189.
- combustible, estimation of phosphorus and acetylene in (EITNER and KEPPELER), A., ii, 689.
- explosive, inflammability of thin layers of (EMICH), A., ii, 150.
- monatomic, a property of (BERTHELOT), A., ii, 639.
- rarefied (COLSON), A., ii, 160.
- from igneous rocks by the action of heat (GAUTIER), A., ii, 171.
- practical methods for the rapid spectroscopic analysis of (BERTHELOT), A., ii, 684.
- analysis of, by means of the electric spark (BERTHELOT), A., ii, 685.
- estimation of cyanogen in (NAUSS), A., ii, 43.
- Gaseous compounds**, molecular specific heats of dissociable (PONSOT), A., ii, 84.
- specific heat of, in chemical equilibrium (PONSOT), A., ii, 302.
- dissociation of, and Gay-Lussac's law (PONSOT), A., ii, 542.
- liquefaction of (CAUBET), A., ii, 147, 148.
- Gastric juice**, influence of certain materials on the quantity and quality of (HERZEN), A., ii, 323.
- digestive power of (FROUIN), A., ii, 561.
- acidity of (BERTHELOT), A., ii, 610.
- estimation of hydrochloric acid in (MEUNIER), A., ii, 342.
- estimation of rennet-ferment in (MEUNIER), A., ii, 115.
- See also Digestion and Stomach.
- Gastric secretion**, substances which stimulate (HERZEN), A., ii, 323; (RADZIKOWSKI; MARK-SCHNORF), A., ii, 401; (FROUIN and MOLINIER), A., ii, 402.
- Gay-Lussac's law** and the dissociation of gaseous compounds (PONSOT), A., ii, 542.
- Geese**, respiratory quotient in (BLEIBTREU), A., ii, 457.
- Geissler potash apparatus**, improvement on the (WETZEL), A., ii, 74.
- Gelatin**, hydrolysis of (FISCHER), A., i, 745.
- new test for (HENZOLD), A., ii, 52.
- Gelatin membrane** as filters, errors in the use of (REID), A., ii, 675.
- Gentianose** and sucrose, presence of, in gentian root (BOURQUELOT and HÉRISSEY), A., ii, 34.
- constitution of (BOURQUELOT and HÉRISSEY), A., i, 258.
- Gentiobiose** (BOURQUELOT and HÉRISSEY), A., i, 258.
- Geolyte** a mineralogical constituent of Keuper marl (WÜLFING), A., i, 113.
- cycloGeranic acid** and **cycloGeraniolene** and their isomerides (TIEMANN and SCHMIDT), A., i, 157.
- α -cycloGeranic acid**, constitution of (TIEMANN and TIGGES), A., i, 158.
- β -cycloGeranic acid** and its oxidation products (TIEMANN and SCHMIDT), A., i, 159.
- Geranium**, formation of terpene derivatives in the (CHARABOT), A., i, 38.
- oil of, from Cannes (JEANCARD and SATIE), A., i, 396.
- Geranyl acetate** in eucalyptus oil (SMITH), A., i, 282.
- Germination**. See Agricultural Chemistry.
- Gibbsite** from Klein-Tresny, Moravia (KOVÁR), A., ii, 606.
- Gismondite** (*zeagonite*), a new alteration product of nephelite (THUGUT), A., ii, 112.
- Gland**, submaxillary, metabolism of the (BARCROFT), A., ii, 28, 689.
- suprarenal. See Suprarenal.
- thymus, proteids of the (PEKELHARING and HUISKAMP), A., i, 175; (HUISKAMP), A., ii, 461.
- thyroid, physiological action of substances from the (v. CYON and OSWALD), A., ii, 180.
- Glands**, physiology of (ASHER and CUTLER), A., ii, 176.
- Glass**, illumination of different kinds of (SPRING), A., ii, 297.
- gradual change in, and its influence on thermometry (MARCHIS), A., ii, 491.
- slow action of hydrogen bromide on (BERTHELOT), A., ii, 19.
- reducing action of (COLSON), A., ii, 160.
- Glaucescence** of feldspars (VIOLA), A., ii, 320.
- Glaucine** and its salts (SCHMIDT), A., i, 742; (FISCHER), A., i, 743.
- Glaucium luteum*, alkaloids of (SCHMIDT), A., i, 742; (FISCHER), A., i, 743.
- Glaucophane-schists** (WASHINGTON), A., ii, 172.
- Globulin** as alkali-proteid, and its formation from albumin (STARKE), A., i, 242.
- Globulins** of aleurone-grains of seed (TSCHIRCH and KRITZLER), A., ii, 33.
- Glucamine**, and its oxalate and oxamide (MAQUENNE and ROUX), A., i, 372.
- Glucose** (ISSAEW), A., ii, 262.

- d*-Gluconic acid, behaviour of, in the organism (MAYER), A., ii, 261.
- Gluco-proteid of bone (HAWK and GIES), A., i, 298; ii, 520.
- Glucoproteins as a culture media for micro-organisms (LEPIERRE), A., i, 622.
- Glucosamine from crystallised egg-albumin (LANGSTEIN), A., i, 108.
action of phenylcarbimide on (STEUDEL), A., i, 674.
- Glucose, commercial, estimation of dextrose and dextrin in (LINDER), A., ii, 134; (MEUNIER), A., ii, 286.
- d*-Glucose. See Dextrose.
- Glucoside, $C_{23}H_{24}O_{10}$, from the action of aqueous potassium hydroxide and methyl iodide on apiin (VONGER-ICHTEN), A., i, 40.
in beech seedlings (TAILLEUR), A., ii, 466.
from the flowers of *Delphinium Consolida* (PEKRIN and WILKINSON), P., 1900, 182; (PERKIN), P., 1901, 88.
in *Frangula*, *Sagrada*, *Rhubarb* and *Ladic Rhapontici* (AWENG), A., i, 39.
- Glucosides, synthesis of (FISCHER and ARMSTRONG), A., i, 671.
preparation of synthetical (RYAN and MILLS), T., 704; P., 1901, 90.
heat of combustion of (FISCHER and V. LOEBEN), A., ii, 225.
behaviour of acid aqueous solutions of, towards different solvents, and resisting power of, to putrefaction (PROELSS), A., ii, 706.
- Glucosides. See also :—
Apiin.
Carvacrylglucoside.
Cereic acid.
Coriamyrtin.
m-Cresylglucoside.
Digitonin.
Digitoxin.
Erysimin.
Filicitanic acid.
Helicin.
Hesperidin.
Hydroæsculetin.
Indican.
Jalapin.
Lotusin.
 α -Naphthylgalactoside.
Ononin.
Onospin.
Osyritrin.
Phloridzin.
Quercitrin.
Rhamnazin.
Rhamnetin.
- Glucosides. See :—
Rhododendrin.
Robinin.
Rutin.
Saponins.
Solanine.
Tetracetyl- β -naphthylglucoside.
Tetracetyl- β -phenylglucoside.
Tutin.
Violaquercitrin.
Xanthorhamnin.
- Glutaconic acid (*propylenedicarboxylic acid*), ethyl ester, and its derivatives, formation of aromatic compounds from (LAWRENCE and PERKIN), P., 1901, 47.
bimolecular (GUTHZEIT and WEISS), A., i, 314.
- Glutamic acid, *d*-diethyl ester (FISCHER), A., i, 193.
- Glutaric acid (*n-pyrotartaric acid*; *propenedicarboxylic acid*), *r*- α -dibromo- (THIELE), A., i, 182.
 α -chloro-, and its diethyl ester and salts (JOCHM), A., i, 129.
- Glutaric diazoimide and dihydrazide and their derivatives (CURTIUS and CLEMM), A., i, 68.
- Gluten, variation in the amounts of, in wheat (VIGNON and COUTOURIER), A., ii, 335.
- Glyceraldehyde, preparation of, and its phenylhydrazones, *p*-bromophenyl- osazone, and chlorohydrin and its *p*-bromophenylhydrazone (WOHL and NEUBERG), A., i, 12.
- Glyceraldoxime (WOHL and NEUBERG), A., i, 13.
- Glyceric acid, amide, anilide, and *o*- and *p*-toluidides, preparation and rotation of, and preparation of the inactive compounds (FRANKLAND, WHARTON, and ASTON), T., 266; P., 1901, 6.
esters, hydrolysis of (HANRIOT), A., ii, 175, 324.
- Glycerides, mixed, in natural fats (HOLDE and STANGE), A., i, 577.
- Glyceroarsenic acid, calcium salt (PAGEL), A., i, 498.
- Glycerol (*glycerin*), influence of, as solvent, on the rotation of ethyl tartrate (PATTERSON), T., 178; P., 1900, 177.
veratrine-like action of (LYLE), A., ii, 181.
diaryl ethers, action of phosphorus chlorides on (BOYD), T., 1221; P., 1901, 188.
esterification of (BÖTTINGER), A., i, 661.
salicylate (TÄUBER), A., i, 538.

- Glycerol** (*glycerin*), examination of (FERRIER), A., ii, 203.
 estimation of (LEWKOWITSCH), A., ii, 285.
 estimation of, in fat (BULL), A., ii, 138.
- Glycine** (*glycocine*; *aminoacetic acid*), reactions of (JOLLES), A., i, 30, 191.
 ethyl ester, its reactions and pierate (FISCHER), A., i, 192.
- Glycine anhydride** (BALBIANO), A., i, 454.
- Glycogen** in animal organs (MEILLÈRE and LÉPER), A., ii, 326.
 occurrence and disappearance of, in yeast cells (MEISSNER), A., ii, 263.
 in parasitic worms (WEINLAND), A., ii, 258.
 formation of, after feeding on galactose (WEINLAND), A., ii, 29.
 formation of, after proteid feeding (BLUMENTHAL and WÖHLGENUTH), A., ii, 610.
 composition and properties of (NERKING), A., ii, 462.
 molecular weight of (JACKSON), A., i, 371.
 as a stimulant of gastric secretion (MARK-SCHNORF), A., ii, 402.
 of yeast, alcohol and carbon dioxide produced by the autofermentation of (HARDEN and ROWLAND), T., 1228; P., 1901, 189.
 estimation of (LEBBIN), A., ii, 45; (BUJARD), A., ii, 700.
 estimation of, by the Pflüger-Nerking method (SALKOWSKI; PFLÜGER), A., ii, 135.
- Glycol**. See Ethylene glycol.
- Glycol**, $C_8H_{16}O_2$, from ethyl succinate and magnesium ethiodide (VALEUR), A., i, 317.
 $C_8H_{16}O_3$, from the oxidation of dihydromyrcene (SEMMLER), A., i, 732.
 $C_{10}H_{20}O_2$, from the reduction of diosphenol (KONDAKOFF and BACHTSCHÉEFF), A., i, 335.
 $C_{10}H_{22}O_2$, and its diacetyl derivative, from isovaleraldehyde (LEDERER; ROSINGER), A., i, 669.
 $C_{11}H_{15}O_4N$, from *o*-nitrobenzaldehyde and isobutaldehyde (HERZOG and KRUH), A., i, 213.
 $C_{12}H_{18}O_3$, and $C_{13}H_{20}O_3$, and their diacetyl derivatives, from *o*-methoxy- and *o*-ethoxy-benzaldehyde and isobutaldehyde (HERZOG and KRUH), A., i, 213.
 from isobutaldehyde and isovaleraldehyde, action of sulphuric acid on (LÖWY and WINTERSTEIN), A., i, 626.
- Glycolaldehyde** and its diphenylosazone and *p*-nitrophenylosazone (WOHL and NEUBERG), A., ii, 13.
- Glycollamide**, acetyl and bromoamide derivatives (HANTZSCH and VOEGELEN), A., i, 676.
- Glycollic acid**, estimation of, in presence of glycine (BALBIANO), A., i, 454.
- Glycolliminohydrin**, formula and conductivity of (HANTZSCH and VOEGELEN), A., i, 676.
- Glycurone**. See Glycuronolactone.
- Glycurone-amylicercapital**, -diphenylhydrazone, and -thiosemicarbazone (NEUBERG), A., i, 66.
- Glycuronic acid**, combination of, with fatty compounds (NEUBAUER), A., ii, 614.
 its alkaloidal salts, and detection of, in, and separation of, from, sugars (NEUBERG), A., i, 66.
- Glycuronolactone** (*glycuronc*), its oxime, semicarbazone and phenylhydrazones (GIEMSA), A., i, 11; (NEUBERG), A., i, 66.
 separation of, from sugars (NEUBERG), A., i, 66.
- Glycylglycine** and its salts, esters, and phenylcarbinide and its ethyl ester (FISCHER and FOURNEAU), A., i, 675.
- Glyoxal**, condensation of, with benzaldehyde and ammonia (WEWIÓRSKI), A., i, 353.
- Glyoxalines**, substituted (KUNCKELL), A., i, 293; (KUNCKELL and DONATH), A., i, 567.
- Glyoxylic acid** and its salts (DOEBNER and GLASS), A., i, 629.
 chemistry of (HOPKINS and COLE), A., i, 310.
 compounds of, with guanidine and aminoguanidine (DOEBNER and GÄRTNER), A., i, 261, 630.
- Glyoxylthiocarbamide** (DOEBNER and GLASS), A., i, 630.
- Gneiss**, carbonaceous, in the Black Forest (ROSENBUSCH), A., ii, 113.
- Gold** from Western Australia (SIMPTON), A., ii, 454.
 recovery of, from cupriferous materials (GODSHALL), A., ii, 42.
 melting point of (HOLBORN and DAY), A., ii, 85.
 diffusion of, in solid lead at the ordinary temperature (ROBERTS-AUSTEN), A., ii, 9.
 colloidal, catalytic action of (BREDIG and REINDERS), A., ii, 442.
 action of ammonia on, at high temperatures (BEILBY and HENDERSON), T., 1253; P., 1901, 190.

- Gold, Egyptian**, composition of ancient (BERTHELOT), A., ii, 25.
- Gold alloys** from Egyptian tombs (BERTHELOT), A., ii, 514.
with copper, certain properties of (ROBERTS-AUSTEN and ROSE), A., ii, 25.
- Gold sodium chloride**, assay of (JOHNSON & SONS), A., ii, 350.
silver tellurides from Colorado (PALACHE), A., ii, 109.
from Coolgardie, Western Australia (KRUSCH), A., ii, 393; (CARNOT), A., ii, 515.
from Cripple Creek and Coolgardie (RICKARD), A., ii, 663.
See also Calaverite, Coolgardite, Petzite, and Sylvanite.
- Gold, estimation of:**—
sources of loss in the estimation of, in copper bars, and a method for its avoidance (VAN LIEW), A., ii, 41.
estimation of, in pyrites (BUDDÉUS; LOEVY), A., ii, 133.
- Gold nuggets**, crystalline structure of (LIVERSIDGE), A., ii, 662.
- Gorse.** See Agricultural Chemistry.
- Gout**, metabolism in (WATSON), A., ii, 68.
- Graminin** in the root swellings of *Arrhenatherum bulbosum* (HARLAY), A., ii, 267.
- Granatonineoxime** and its reduction, and its picrate and benzoyl derivative (PICCININI and CORTESE), A., i, 740.
- ψ-**Granatylamine** and its salts and phenylthiocarbimide (PICCININI and CORTESE), A., i, 740.
- Granite**, action of acids on (GAUTIER), A., ii, 14, 92.
- Grapes**, presence of invertin in (MARTINAND), A., ii, 35.
pressed. See Agricultural Chemistry.
- Graphite** from Ceylon (COOMARA-SWAMY), A., ii, 171.
- Grasses.** See Agricultural Chemistry.
- Green manure.** See Agricultural Chemistry.
- Groups**, non-occurrence of direct interchange of, in a molecule (LAPWORTH), T., 1265; P., 1901, 93.
- Guaiacol carbonate** (CHEMISCHE FABRIK VON HEYDEN), A., i, 696.
chlorocarbonate (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 662.
- Guaiacol**, tribromo-, action of nitric acid on (COUSIN), A., i, 82.
p-nitro-, and its ethyl ether (FREYSS), A., i, 321.
- Guaiacolsulphonic acid**, triphenylguanidine ester (GOLDSCHMIDT), A., i, 643.
- 2-Guaiacyloxymethyl-5-methyl- and -5-ethoxy-benziminazoles** and their picrates (COHN), A., i, 352.
- 1-Guaiacyloxymethylbenzoxazole** (COHN), A., i, 752.
- Guanamines**, α-disubstituted (CRAMER), A., i, 771.
- Guanazoguanazole** and its salts and acetyl derivatives (PELLIZZARI and RONCAGLIOLI), A., i, 773.
- Guanazole** and its derivatives, nomenclature of (PELLIZZARI and RONCAGLIOLI), A., i, 774.
- Guanidine sulphonates** (REMSEN and GARNER), A., i, 270.
- γ-**Guanidinebutyric acid** (KUTSCHER), A., i, 561.
- Guanidineglyoxylic acid**, and amino- (DOEBNER and GÄRTNER), A., i, 261, 630.
- Guanine**, presence of, in commercial uric acid (HUGOUNENQ), A., i, 262.
electrolytic reduction of (TAFEL and ACH), A., i, 426.
- Guano.** See Agricultural Chemistry.
- Guanylcaramide sulphonates** (REMSEN and GARNER), A., i, 270.
- Guanylic acid** (BANG; KOSSEL; LEVENÉ), A., i, 299.
physiological action of (BANG), A., ii, 408.
- Gum arabic**, amount of pentosans in (HEFELMANN), A., ii, 535.
evaluation of (FROMM), A., ii, 426; (DIETERICH), A., ii, 584.
- Gum tragacanth** (TOLLENS), A., i, 453.
constituents of (O'SULLIVAN), T., 1164; P., 1901, 156.
detection of, in cocoa and chocolate (WELMANS), A., ii, 288.
- Gun-cotton**, behaviour of aqueous formaldehyde towards (VANINO), A., i, 372.
estimation of soluble nitrocellulose in (QUINAN), A., ii, 480.
- Gypsum**, transformation of, into anhydrite (VAN'T HOFF, HINRICHSSEN, and WEIGERT), A., ii, 506.
estimation of unburnt and overburnt, in the plaster of Paris from the kilns (PÉRIN), A., ii, 129.
- Gyrophoric acid**, formula of (HESSE), A., i, 151.
- Gyrophorin** (ZOFF), A., i, 88.

H.

- Hæmatic acids**, constitution of the (KÜSTER), A., i, 53, 298.
- Hæmatin**, action of reducing agents on (MILROX), A., i, 656.

- Hæmatin**, oxidation of, by ammonium persulphate (HUGOUNENQ), A., i, 242.
 Arnold's neutral (VAN KLAVEREN), A., i, 782.
- Hæmatoxylin** (HERZIG and POLLAK), A., i, 478.
- Hæmin**, reduction products and constitution of (NENCKI and ZALESKI), A., i, 434.
 detection of, in blood (RICHTER), A., ii, 296.
 iodo- (KURAÉEFF), A., i, 298.
- Hæmocyanin** (HENZE), A., i, 783.
- Hæmoglobin**, influence of various substances on the crystallisation of (v. STEIN), A., i, 176.
 estimation of, colorimetrically (HALDANE), A., ii, 488.
 crystals for the distinction between animal and human blood (MOSER), A., ii, 712.
 new instrument for the estimation of, in blood (GAERTNER), A., ii, 712.
 cell for the clinical estimation of, in urine (ADAM), A., ii, 488.
- Carboxyhæmoglobin**, behaviour of, in the magnetic field and electrolysis of (GAMGEE), A., i, 782.
- Iodohæmoglobin** (KURAÉEFF), A., i, 298.
- Methæmoglobin** (KOBERT), A., i, 242.
 behaviour of, in the magnetic field (GAMGEE), A., i, 782.
- Oxyhæmoglobin**, behaviour of, in the magnetic field and electrolysis of (GAMGEE), A., i, 782.
 from horses, decomposition products of (LAWROFF), A., i, 243.
- Hæmolysis** produced by solanine (HÉDON), A., ii, 325.
- Hæmopyrrole** and its pierate and compound with mercuric chloride (NENCKI and ZALESKI), A., i, 434.
 reduction of phyllocyanin to (NENCKI and MARCHLEWSKI), A., i, 554.
- Halogen compounds**, organic, dissolved in ethyl alcohol, decomposition of, by sodium (LÖWENHERZ), A., ii, 308.
- Halogens**, action of, on frog's muscles (STOCKMAN and CHARTERIS), A., ii, 255
 test for, in blowpipe analysis (NICHOLS), A., ii, 342.
- Halphen's test** for cotton-seed oil (WRAMPPELMAYER), A., ii, 207; (SOLTSIEN), A., ii, 292, 430.
- Harman** and its amino-derivatives, Harmaline, Harmine, and Harmalol from *Peganum Harmala* (FISCHER), A., i, 405.
- Hauerite**, chemical action between dry, and various metals (STRÜVER), A., ii, 317.
- Hay**. See Agricultural Chemistry.
- Heat**. See Thermochemistry.
- Helicin cyanohydrin** (FISCHER), A., i, 275.
- Helium**, occurrence of, in uranium minerals (KOHLSCHÜTTER), A., ii, 598.
 preparation and physical properties of (RAMSAY and TRAVERS), A., ii, 237.
 isolation of, from air, and liquefaction of (DEWAR), A., ii, 597.
 spectrum of (LIVEING and DEWAR), A., ii, 213.
 refraction of (RAMSAY), A., ii, 141.
- m*-**Hemipinic acid** and its ethylimide (GILBODY, PERKIN, and YATES), T., 1400; P., 1899, 28, 75, 241; 1900, 107.
- Hemp-cake**. See Agricultural Chemistry.
- Hentriacontane** and **Heptacosane** from tobacco leaf (THORPE and HOLMES), T., 982; P., 1901, 170; (KISSLING), A., ii, 680.
- Heptacetylchloromaltose** and **Heptacetyl- β -methylmaltoside** (FISCHER and ARMSTRONG), A., i, 671.
- cyclo***Heptadiene** and its *di*bromide (WILLSTÄTTER), A., i, 224.
- n*-**Heptane** from coniferous trees (BLASDALE), A., i, 357.
- Heptanedicarboxylic acids**. See:—
 Azelaic acid.
 Diethylglutaric acid.
 Methylpropylglutaric acid.
 α -Propyladipic acid.
- Heptanetricarboxylic acids**. See:—
 Ethylpentanetricarboxylic acid.
 α -Propylbutanetricarboxylic acid.
 Trimethylbutanetricarboxylic acid.
- $\Delta^{1,3,5}$ *cyclo***Heptatriene**, synthesis and physical constants of (WILLSTÄTTER), A., i, 649.
- $\Delta^{1,3,6}$ *cyclo***Heptatriene** (*tropilidene*) from suberone (WILLSTÄTTER), A., i, 223.
mono- and *di*-hydrobromide (WILLSTÄTTER), A., i, 225.
- β -*cyclo***Heptatrienecarbonylamide** (BRAREN and BUCHNER), A., i, 385.
- Δ^2 -*cyclo***Heptene**, amino-, and its salts and phenylthiocarbamide, and its isomeride (WILLSTÄTTER), A., i, 224.
- Δ^2 -*cyclo***Heptenecarboxylic acid**, ethyl ester, chloride, azide, and hydrazide (WILLSTÄTTER), A., i, 649.
- cyclo***Heptenecarboxylic acids**, Δ^1 - and Δ^2 - (WILLSTÄTTER), A., i, 224, 649.
- Hepteno-aldehyde** (KOHN), A., i, 255.
- Heptenoic acid** (β -methyl- γ -*hexenoic acid*), $\gamma\delta$ -*di*bromo- (v. PECHMANN), A., i, 65.

- Heptenonitrile** (KOHN), A., i, 255.
- Hepthydroxamic acid** (ANGELICO and PANARA), A., i, 708.
- Heptinene** ($\beta\delta$ -dimethyl- $\beta\delta$ -pentadiene) and its tetrabromide, dihydrobromide and dimeric compound (GRIGNARD), A., i, 680.
- Heptioic acid** (β -methylhexoic acid), $\gamma\delta$ -dibromo- (V. PECHMANN), A., i, 65.
- n-Heptioic anhydride** (KRAFFT and ROSINY), A., i, 113.
- Heptolactoneacetic acid** and its salts (FITTIG and GUTHRIE), A., i, 122.
- Heptyl alcohol**, action of, on its sodium derivative (GUERBER), A., i, 182.
- Heptylamine soaps**, action of water on (KRAFFT and FUNCKE), A., i, 63.
- Heptylene glycol** and its diacetyl derivative (KOHN), A., i, 255.
- Heptylidenedianiline anhydrosulphite** (EIBNER), A., i, 378.
- Herrings**, chemical and microbiological investigations on the salting of (SCHMIDT), A., ii, 409.
- Hesperidin**, action of, on the kidneys (V. KÖSSA), A., ii, 31.
- Heteroalbumose**. See Albumose.
- Heumite**, a dyke-rock from Heum (BRÖGGER), A., i, 169.
- Hexadecenoic acid** (THOMS and FENDLER), A., i, 252.
- Hexadecioic anhydride** (*palmitic anhydride*) (KRAFFT and ROSINY), A., i, 113.
- Hexaethoxydiphenyl** (BREZINA), A., i, 701.
- Hexahydrobenzene**. See *cyclo*Hexane.
- Hexahydronaphthalene**, dispersion of (PELLINI), A., ii, 365.
- Hexahydroxyanthraquinone**, 1:3:4:5:7:8, formation of (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 729.
- Hexahydroxyaurin**. See Eupittone-black.
- Hexahydroxydiphenyl** and its acetylation (BREZINA), A., i, 701.
- Hexahydro-m-xylene** and iodo- (LEES and PERKIN), T., 349.
- Hexahydroxy-leucaniline** and its non-acetyl derivative and hydriodide and hydrochloride (LIEBERMANN and WIEDERMANN), A., i, 384.
- Hexahydro-xylic acid**. See Dimethyl-*cyclo*hexanecarboxylic acid.
- Hexamethoxyaurin**. See Eupittone.
- Hexamethyl-4:4':4'-tri-amino-2-hydroxy-triphenylmethane** and **Hexamethyl-4:4':4'-tri-aminophenylfluorene** (HALLER and GUYOT), A., i, 569.
- Hexamethylene**. See *cyclo*Hexane.
- Hexamethylenediamine**. See Hexane, $\alpha\zeta$ -diamino-.
- Hexamethylene-dicarbanilide** and -carbamide (CURTIU and CLEMM), A., i, 69.
- Hexamethylenetetramine** (*urotropine*), influence of, on intestinal putrefaction (LOEBISCH), A., ii, 667.
- Hexane** (β -methylpentane), $\beta\delta$ -diamino-, and its phosphate (HARRIES), A., i, 194.
- Hexane**, $\alpha\zeta$ -diamino-, synthesis of, from suberic acid, and its diacetyl and dibenzoyl derivatives and salts (CURTIUS and CLEMM), A., i, 69.
- bromo-. See Hexyl bromide.
- $\beta\epsilon$ -dibromo-, and its isomeride (WISLIZENUS, PETERS, SCHRAMM, and MOHR), A., i, 665.
- $\beta\zeta$ -dibromo-, and its stereoisomeride (MOHR), A., i, 364.
- cyclo*Hexane (*hexahydrobenzene*) (SABATIER and SENDERENS), A., i, 459.
- preparation of (SABATIER and SENDERENS), A., i, 195.
- cyclo*Hexane, *cyclo*Hexanol, *cyclo*Hexanone, and *cyclo*Hexanepinacone (ZELINSKY), A., i, 683.
- Hexanedicarboxylic acids**. See :—
- Dimethyladipic acid.
- α -Ethyladipic acid.
- Methylethylglutaric acid.
- α -Methylipimelic acid.
- α -Propylglutaric acid.
- iso*Propylglutaric acid.
- Trimethylglutaric acid.
- Hexanetetracarboxylic acids**. See Methylpentanetetracarboxylic acids.
- Hexanetricarboxylic acids**. See :—
- Dimethylbutanetricarboxylic acids.
- α -Propylpropanetricarboxylic acid.
- $\alpha\beta\epsilon$ -Hexanetriol (TRAUBE and LEHMANN), A., i, 502.
- Δ^1 -*cyclo*Hexanecarboxylic acid, 2-amino-, ethyl ester (DIECKMANN), A., i, 542.
- β -Hexene- ϵ -one- $\gamma\delta$ -dicarboxylic acid, β -amino-, ethyl ester (KNORR and RABE), A., i, 163.
- Hexenoic acid** (*n*-pentenecarboxylic acid) (WALKER and LUMSDEN), T., 1200.
- Hexenoic acids**, $\gamma\delta$ - and $\delta\epsilon$ -, preparation of (FICHTER and LANGGUTH), A., i, 63.
- Hexinene** (β -methyl- $\alpha\delta$ -pentadiene; *as-methylallylethylenc*) (LJUBARSKY), A., i, 181.
- Hexinene** (*methylisoprene*; *methylpentadiene*) (HARRIES), A., i, 194.
- Hexinene** (*diisopropenyl*) (KONDAKOFF), A., i, 62, 305.
- polymerisation of (KONDAKOFF), A., i, 625.
- di*- and *tetra*-bromides (KONDAKOFF), A., i, 62.
- n*-Hexoamide (AUTENRIETH), A., i, 186.

- Hexoic acid** (*caproic acid*), α -amino-, *i*-ethyl ester (FISCHER), A., i, 193.
- iso***Hexoic acid** (γ -*methylvaleric acid*) and its γ -chloro-derivative (NOYES), A., i, 631.
- α -chloro-, and its ethyl ester (JOCHM), A., i, 129.
- n*-**Hexoic anhydride** (AUTENRIETH), A., i, 186.
- iso***Hexolactone**, preparation of (NOYES), A., i, 631.
- Hexon bases** in deuterio- and hetero-albumoses (HASLAM), A., i, 492.
- Hexoylactic acid** and its methyl and ethyl esters (MOUREU and DELANGE), A., i, 360.
- iso***Hexoylisobutyric acid**, ethyl ester (BLAISE), A., i, 253.
- s-n*-**Hexoylhydrazide** (AUTENRIETH and SPIESS), A., i, 230.
- Hexyl bromide** (BODROUX), A., i, 306 ; (MOUNEYRAT), A., i, 441.
- Hexylene**, oxidation of (ENGLER and FRANKENSTEIN), A., i, 658.
- Hexylene** ($\beta\gamma$ -*dimethyl- β -butylene*) di-bromide and dichloride, action of alcoholic potash on (KONDAKOFF), A., i, 62.
- Hexylpropionic acid**. See Noninoic acid.
- Hibernation** in bats (RULOT), A., ii, 256.
- Hibiscus esculentus*. See Agricultural Chemistry.
- Hippuric acid**, oxidation of, to carbamide (JOLLES), A., i, 30.
- metabolism of (JOLLES), A., ii, 115 ; (LEWIN), A., ii, 518.
- estimation of (CATES), A., ii, 358.
- Histon** from fish sperm (EHRSTRÖM), A., ii, 401.
- Homopilopic acid**, constitution of and its ethyl ester and barium salt (JOWETT), T., 1338 ; P., 1901, 198.
- Homochelidonine** and its isomerides and salts (SCHMIDT), A., i, 742 ; (FISCHER), A., i, 743 ; (WINTGEN), A., i, 744.
- Hops**. See Agricultural Chemistry.
- Hornblende** from Butte, Montana (WEED), A., ii, 65.
- from Christiania district (BRÜGGER), A., ii, 169.
- from the Tatra Mountains (GORAZDOWSKI), A., i, 170.
- Hornblende** from Brandberget (BRÜGGER), A., ii, 170.
- Horses**. See Agricultural Chemistry.
- Hübl's iodine solution** (KITZ), A., ii, 587.
- Hühnerite** from Nova Scotia (HOFFMANN), A., ii, 319.
- Humic acid** and its rôle in nature (BORNTRÄGER), A., ii, 122.
- estimation of (BORNTRÄGER), A., ii, 212.
- Humic acids**, free, in mineral soil and their importance in agriculture (IMMENDORFF), A., ii, 620.
- Humus**, estimation of (RIMBACH), A., ii, 37.
- estimation and composition of, and its nitrification (RIMBACH), A., ii, 37.
- estimation of, in soil (BIELER and ASÖ), A., ii, 709.
- See also Agricultural Chemistry.
- Hussakite**, allied to xenotime, from Brazil (KRAUS and REITINGER), A., ii, 395.
- Hydantoic acid** (*carbaminoacetic acid*), ethyl ester and nitroso-derivative (HARRIES and WEISS), A., i, 71.
- Hydantoin**, preparation of (HARRIES and WEISS), A., i, 71.
- Hydration**, substances which accelerate or retard (ROHLAND), A., ii, 18.
- of dissolved substances (NERNST ; LOTMAR), A., ii, 12 ; (GARRARD and OPPERMAN), A., ii, 13.
- Hydrazic acid** and its methyl ester (HANTZSCH and LEHMANN), A., i, 133.
- Hydrazine**, action of, on the isomeric methyl butyrylacetates (BONGERT), A., i, 409.
- action of, on oxalacetic acid (FENTON and JONES), T., 93 ; P., 1900, 205.
- Hydrazine hydrate**, condensation of, with acetylacetone (GRAY), T., 682 ; P., 1901, 90.
- action of, on α -methyl- β -ethylacetaldehyde (DEMME), A., i, 255.
- Hydrazines**, aromatic, action of nitroso-benzene on (SPITZER), A., i, 98.
- reaction of, with wood (COVELLI), A., ii, 705.
- s*-**Hydrazines**, secondary acid, simple method of obtaining (AUTENRIETH and SPIESS), A., i, 230 ; (STOLLÉ), A., i, 316.
- o*-**Hydrazinobenzoic anhydride**, preparation of (FISCHER and SEUFFERT), A., i, 411.
- 6-Hydrazino-4-methylpyrimidine** (GABRIEL and COLMAN), A., i, 427.
- 8-Hydrazino-4-methylumbelliferone** (v. PECHMANN and OBERMILLER), A., i, 337.
- β -*o*-, -*m*-, and -*p*-**Hydrazinophenylbenz-iminoazoles** and their salts (MIKLASZEWSKI and v. NIEMENTOWSKI), A., i, 761.
- Hydrazobenzene**, autoxidation of (MANCHOT and HERZOG), A., i, 574.
- Hydrazobenzenes**, action of, on aldehydes (RASSOW ; RASSOW and LUMMERZHEIM), A., i, 777.

- Hydrazodiphenyls**, products of the transformation of (FRIEBEL and RASSOW), A., i, 575.
- o-Hydrazotoluene**, *p*-diamino- (ELES and SCHWARZ), A., i, 619.
- Hydrindacene** and its derivatives (EPHRAIM), A., i, 688.
- Hydrindamine** bromocamphorsulphonate and isomeric *cis*- π -camphanates (KIPPING and HALL), T., 439; P., 1901, 37.
- camphor- π -sulphonates, isomeric (KIPPING), T., 370; P., 1901, 32.
- mandelates, isomeric (KIPPING and HALL), T., 444; P., 1901, 36.
- dl*-**Hydrindamine** camphor- α -sulphonate and *d*-hydroxy-*cis*- π -camphanate (KIPPING and HALL), T., 437; P., 1901, 37.
- Hydrindene**, action of nitric acid on (DÜNKELSÜHLER), A., i, 44.
- Hydriodic acid**. See under Iodine.
- Hydroæsculetin** (LIEBERMANN and WIEDERMANN), A., i, 736.
- Hydrobromic acid**. See under Bromine.
- Hydrocarbon** from the distillation of quinolylenephenylenemethane (NÖLTING and BLUM), A., i, 728.
- C_5H_8 , from lupulinic acid (BARTH), A., i, 40.
- C_6H_{10} , from dimethylallylcarbinol (LJUBARSKY), A., i, 181.
- C_8H_{14} , from the distillation of subereneacetic acid (WALLACH and VAN BEECK-VOLLENHOVEN), A., i, 156.
- C_9H_{14} , from the reduction of terpinene nitrosite (SEMMLER), A., i, 331.
- C_9H_{16} , from chlorotrimethylhexamethylene, sodium, and dry ether (MABERY and SIEPLEIN), A., i, 306.
- C_9H_{16} , and its *di*bromide, from the action of sulphuric acid on the glycol from isobutaldehyde and isovaleraldehyde (LÖWY and WINTERSTEIN), A., i, 626.
- $C_{10}H_{16}$, from the oil of buchu leaves (KONDAKOFF and BACHTSCHÉEFF), A., i, 334.
- $C_{10}H_{18}$, from the ester $C_{13}H_{22}O_2$ (v. BRAUN), A., i, 157.
- $C_{12}H_{16}$, from quinitol (WILLSTÄTTER and LESSING), A., i, 265.
- $C_{14}H_{26}$, from the distillation of the wax of the wild fig tree (GRESHOFF and SACK), A., i, 446.
- $C_{15}H_{30}$, from beeswax (GRESHOFF and SACK), A., i, 446.
- $C_{16}H_{14}$, from the action of sodium ethoxide on acetophenone and ethyl malonate (STOBEE), A., i, 549.
- Hydrocarbon**, $C_{16}H_{34}$, from the distillation of the wax $C_{37}H_{74}O_2$ (GRESHOFF and SACK), A., i, 446.
- $C_{18}H_{20}$, from phenylmethyl ethylene (GRIGNARD), A., i, 681.
- $C_{20}H_{32}$, from sandarac resin (HENRY), T., 1156; P., 1901, 187.
- $C_{20}H_{38}$, from the action of acetone on magnesium, ether, and 1-methylcyclohexyl-3 iodide (ZELINSKY), A., i, 661.
- $(C_{23}H_{18})_x$, from the reduction of hydroxybenzylbenzylideneindene (THIELE), A., i, 76.
- Hydrocarbons** in Californian petroleum, chloro-derivatives of (MABERY and SIEPLEIN), A., i, 306.
- coal tar, microchemical distinction of the (BEHRENS), A., ii, 351.
- from shale naphtha (STEUART), A., i, 109.
- from Texas petroleum (MABERY), A., i, 441.
- formation of, by direct union of carbon and hydrogen (BONE and JERDAN), T., 1042; P., 1901, 162.
- generation of, by metallic carbides (BERTHELOT), A., i, 245.
- formation of, from nitro-compounds, by the action of metals (SABATIER and SENDERENS), A., i, 638.
- synthesis, of, by means of organo-magnesium compounds (TISSIER and GRIGNARD), A., i, 316; (GRIGNARD), A., i, 393, 679.
- decomposition of, at high temperatures (BONE and JERDAN), P., 1901, 164.
- action of cuprous salts on (BERTHELOT), A., i, 493.
- acetylenic, condensation of, with formaldehyde (MOUREU and DESMOTS), A., i, 442.
- acyclic, action of aluminium bromide on (POURET), A., i, 305.
- aromatic, vapour pressure of a series of (WINKELMANN), A., ii, 57; (WÖRINGER), A., ii, 87.
- hydrogenation of (SABATIER and SENDERENS), A., i, 459.
- ethylenic, formation of (BÉHAL), A., i, 246; (MASSON), A., i, 250.
- saturated, synthesis of (TISSIER and GRIGNARD), A., i, 316.
- terpilenic, complete synthesis of (BERTHELOT), A., i, 247.
- doubly unsaturated, preparation of (HARRIES), A., i, 194.
- See also Olefines and Terpenes.
- Hydrocarbons**. See also :—
- Acenaphthalene.
- Acenaphthene.
- Acetylene.

Hydrocarbons. See :—

Amylenes.
 Anthracene.
 Benzene.
 Benzylideneindene.
 Bisdihydrophenanthrene.
 Bisdihydrophenanthrylene.
 Butane.
*iso*Butane.
 Butinenes.
*iso*Butylbenzene.
*iso*Butylene.
 ψ -Butylenes.
 β -Butylidene*cyclopentene*.
 Camphane.
 Camphene.
 Carvestrene.
 Cinnamylideneindene.
 Citrptene.
 Crotonylene (*butinene*).
 Cumene.
 Cymenes.
 Decanaphthene.
 Dibenzyl.
 Dibenzylmethane.
 Dihydroanthracene.
 Dihydromyrene.
*cyclo*Dihydromyrene.
 Dihydronaphthalene.
 Dihydrotolene.
 Dimenthyl.
 Dimethylacetylene (*butinene*).
 $\beta\gamma$ -Dimethyl- β -butylene (*heptylene*).
s-Dimethylethylenes (ψ -*butylenes*).
 Dimethylfulvene.
 $\beta\zeta$ -Dimethyl- $\delta\zeta$ -heptadiene (*noninene*).
 Dimethylcyclohexanes (*dimethylhexamethylenes*).
 Dimethylindacene.
 $\beta\zeta$ -Dimethyl- $\beta\zeta\theta$ -nonatriene.
 $\beta\delta$ -Dimethyl- $\beta\delta$ -pentadiene (*heptinene*).
 Dimethylpentamethylene.
 1:1-Dimethyl*cyclo*propane (1:1-*dimethyltrimethylene*).
Dicyclopentane.
 Diphenyl.
 $\alpha\delta$ -Diphenyl- $\alpha\gamma$ -butadiene.
s-Diphenylethane.
s-Diphenylethylene (*stilbene*).
 $\alpha\beta$ -Diphenyl- β -methylpropane.
 $\alpha\theta$ -Diphenyl- $\alpha\gamma\eta$ -octatetrene.
 1:2-Diphenyl*cyclopentane*.
 3:5-Diphenyl*isocyclopentenine*.
 Diphenylphenylenemethane.
 Diisopropenyl (*hexinene*).
 Dodecanaphthene.
 Durene.
 Ethane.
 Ethylacetylene (*butinene*).
 Ethylbenzene.
 Ethylene.

Hydrocarbons. See :—

Ethyl*cyclohexane*.
 γ -Ethyl- β -hexene (*octylene*).
 Ethylmenthane.
p-Ethylphenylacetylene.
p-Ethylstyrene.
 Fenchene.
 Fluorene.
*cyclo*Geraniolene.
 Hentriacontane.
 Heptacosane.
*cyclo*Heptadiene.
n-Heptane.
*cyclo*Heptatrienes.
 Heptinene.
 Hexahydrobenzene.
 Hexahydronaphthalene.
 Hexahydro-*m*-xylene.
 Hexamethylene.
 Hexane.
*cyclo*Hexane.
 Hexinenes.
 Hexylene.
 Hydrindacene.
 Hydrindene.
 Indacene.
 Indene.
 ψ -Limonene.
 Menthene.
 Mesitylene.
 Methane.
 Methenementhane.
 γ -Methylbutane (*pentane*).
 β -Methyl- β -butylene (*amylene*).
 1-Methyl-2:3-diphenyl*cyclopentane*.
 Methylene.
 Methyleneethylfulvene.
 1-Methyl-4-ethyl*cyclohexane*.
 β -Methylhepta- $\beta\epsilon$ -diene (*octinene*).
 β -Methylheptene (*octylene*).
 Methyl*cyclohexadiene*.
 Methyl*cyclohexane* (*methylethexamethylene*).
 Methylpentadiene (*hexinene*).
 β -Methyl- $\alpha\delta$ -pentadiene (as -*methylethylethylene*, *hexinene*).
 β -Methylpentane (*heptane*).
 Methylisoprene (*hexinene*).
o-Methylisopropylbenzene.
 1-Methyl-4-isopropyl*cyclohexane*.
 Methylisopropylphenylacetylene.
 Methylisopropylstyrene.
 Myrcene.
 Naphthalene.
 Naphthenes.
 β -Naphthyl*isoheptylene*.
 Naphthylpropylenes.
 Noninene.
 Ocimene.
 Octinene.
 Octylenes.
 Pentadecanaphthene.

Hydrocarbons. See:—

- cyclo*Pentadiene.
- Pentamethylbenzene.
- Pentane.
- iso*Pentane.
- Pentanthrene.
- Pentinene.
- Phellandrene.
- Phenanthrene.
- Phenyldiphenylene-ethane.
- p*-Phenylenediethylene.
- Phenylcyclohexane.
- Phenylmethylethylene.
- Phenylmethylfulvene.
- α -Phenyl- β -methylpropane.
- α -Phenyl- β -methyl- α -propylene.
- α -Phenyl- γ -methyl- $\alpha\gamma$ -tetradiene.
- d*-Pinene.
- Propane.
- cyclo*Propane.
- n*-Propylbenzene.
- Propylene.
- Propylcyclohexane (*propylhexamethyl-*
ene).
- iso*Propylenecyclopentene.
- p-iso*Propylphenylacetylene.
- p-iso*Propylstyrene.
- o-iso*Propyltoluene.
- Stilbene.
- iso*Stilbene.
- Terpinene.
- Tetradecanaphthene.
- Tetradecylacetylene.
- Tetrahydronaphthalene.
- Tetrahydrophenanthrene.
- Tetraphenylcyclopentane.
- Tetraphenylcyclopentene.
- Thujene.
- iso*Thujene.
- Tolane.
- Toluene.
- Tridecanaphthene.
- 1:3:5-Trimethylbenzene.
- 3:4:4-Trimethyldihydrobenzene.
- Trimethylene.
- Trimethylcyclohexanes (*trimethylhexa-*
methylenes).
- $\beta\epsilon\theta$ -Trimethyl- ϵ -nonene.
- 2:4:6-Trimethylphenylacetylene.
- 2:4:6-Trimethylstyrene.
- Trimethyltrimethylenes.
- Triphenylmethane.
- Triphenylmethyl.
- Tropilidene.
- Undecanaphthene.
- Undecinene.
- Xylenes.
- p*-Xylylene.

Hydrocellulose (MURUMOW, SACK, and
TOLLENS; TOLLENS), A., i, 453.
properties of (VIGNON), A.,
i, 16.

*iso***Hydrochelidonic acid** and its salts
(PINNER and KOHLHAMMER), A.,
i, 340.

Hydrochloric acid. See under Chlorine.
Hydrocinchonine (JUNGFLEISCH and
LÉGER), A., i, 287, 338.

Hydrocoumarone, synthesis of (STOERMER
and KAHLERT), A., i, 536.

Hydrocyanic acid. See under Cyanogen.

Hydrofluoric acid. See under Fluorine.

Hydrofluosilicic acid. See under
Fluorine.

Hydrogen, atmospheric, origin of (GAU-
TIER), A., ii, 14, 92, 171, 232.

isolation of, from air (DEWAR), A.,
ii, 597.

liberation of, in the electrolysis of a
mixture of copper sulphate and
sulphuric acid (SAND), A., ii, 82.

evolution of, by the bacterial decom-
position of formic acid (PAKES and
JOLLYMAN), T., 386; P., 1901, 29.

production of, in igneous rocks (GAU-
TIER), A., ii, 171.

volume of, evolved by the action of
acids on granite (GAUTIER), A.,
ii, 14, 92.

spectrum of (LIVEING and DEWAR),
A., ii, 213; (TROWERIDGE), A.,
ii, 633.

conductivity of (TOWNSEND and
KIRKBY), A., ii, 434.

liquefaction of (TRAVERS), A., ii, 379.

liquid and solid, physical properties
of (DEWAR), A., ii, 308, 597.

liquid, boiling point of, determined by
hydrogen and helium gas thermo-
meters (DEWAR), A., ii, 308.

direct union of, with carbon (BONE
and JERDAN), T., 1042; P., 1901,
162.

union of, with chlorine (MELLOR), T.,
216; P., 1900, 221.

diffusion of, through palladium (WIN-
KELMANN), A., ii, 646.

action of, on bismuth sulphide (PÉLA-
BOX), A., ii, 165.

reaction of, with dry carbon dioxide
(BOUDOUARD), A., ii, 383.

behaviour of, towards silver (BERTHE-
LOT), A., ii, 97.

estimation of, in gas mixtures (PHIL-
LIPS), A., ii, 530.

Hydrogen arsenide. See Arsenic *tri-*
hydride.

bromide. See under Bromine.

chloride. See under Chlorine.

cyanide. See under Cyanogen.

fluoride. See under Fluorine.

iodide. See under Iodine.

*tri*iodide, nature of (DAWSON), T., 238;
P., 1900, 215.

- Hydrogen peroxide** (MARCUSE and WOLFFENSTEIN), A., i, 608.
 formula of (v. BAEYER and VILIGER), A., i, 63.
 sensitiveness of, to light, in aqueous solution on addition of ferro- and ferri-cyanide (KISTIAKOWSKY), A., ii, 58.
 catalysis of, by gold (BREDIG and REINDERS), A., ii, 442.
 catalytic decomposition of, as affected by poisons (BREDIG and IKEDA), A., ii, 441; (RAUDNITZ), A., ii, 496; (BREDIG), A., ii, 596.
 catalysis in the reaction between hydriodic acid and (BRODE), A., ii, 443; (MANCHOT and WILHELMS), A., ii, 658.
 action of, on fatty amines (MAMLOCK and WOLFFENSTEIN), A., i, 673.
 action of, on tertiary bases (AUERBACH and WOLFFENSTEIN), A., i, 613.
 and sodium carbonate, action of, on silver nitrate (v. BAEYER and VILIGER), A., ii, 654.
 action of, on silver oxide (v. BAEYER and VILIGER), A., ii, 315, 654; (BERTHELOT), A., ii, 383.
 action of, on thiosulphates (NABL), A., ii, 16, 94.
 action of, on blood (COTTON), A., ii, 295.
 as an antidote for hydrocyanic acid poisoning (HERTING), A., ii, 535.
 detection of calcium oxalate in commercial (ARTII), A., ii, 622.
 estimation of solutions of (NAYLOR and DYER), A., ii, 686.
- Hydrogen peroxides**, higher (BACH), A., ii, 14, 447.
 non-existence of (RAMSAY), T., 1324; P., 1901, 197.
- Hydrogen phosphide** (*phosphine*), heat of formation of (DE FORCRAND), A., ii, 611.
- Hydrogen sulphide**, method for obtaining a saturated aqueous solution of, or a constant supply of the gas (PERKIN), A., ii, 447.
 apparatus, improvement of Küster's (FRERICHS), A., ii, 311.
 formation of, in sewers (BAYERINCK), A., ii, 119.
 action of, on boron bromide (STOCK and POPPENBERG), A., ii, 237; (STOCK and BLIX), A., ii, 650.
 impermeability of skin and external mucous membranes to (CHAUVEAU and TISSOT), A., ii, 611.
 analysis of mixtures of carbonyl sulphide, carbon dioxide and (HEMPEL), A., ii, 651.
- Hydrogen sulphide**, estimation of, in illuminating gas (TUTWILLER), A., ii, 421.
- Hydrogen telluride** (ERNYER), A., ii, 94.
- Hydrogenation** with sodium and alcohol (LADENBURG), A., i, 181.
 direct, in the presence of reduced nickel (SABATIER and SENDERENS), A., i, 195.
- Hydrolysis**. See Affinity.
- Hydromagnesite** from British Columbia (HOFFMANN), A., ii, 320.
- Hydrouracil** (TAFEL and WEINSCHENK), A., i, 72; (TAFEL), A., i, 194.
- Hydrouracils**, synthesis of (FISCHER and ROEDER), A., i, 294.
- Hydroxamic acids**, formation of (ANGELICO and FANARA), A., i, 708.
- Hydroxyacetophenone**, amino- and ω -chloroamino- (KUNCKELL), A., i, 214.
- m*-**Hydroxyacetophenone** and its methyl ester (RUPE and v. MAJEWSKI), A., i, 104.
- Hydroxyacetylpaconol**, Nagai's, constitution of (v. KOSTANECKI and LLOYD), A., i, 736.
- Hydroxy-acids**, $C_7H_{12}O_5$, and $C_8H_{14}O_5$, and their diamides and barium salts, from pilopie and homopilopie acids (JOWETT), T., 1337; P., 1901, 198.
 electrolysis of (HAMONET), A., i, 187.
 action of formaldehyde and benzaldehyde on (ALBERDA VAN EKENSTEIN), A., i, 120.
 action of iodine on the silver salts of (HERZOG and LEISER), A., i, 499.
- β -Hydroxyacrylic acid**, α -cyano-, and their alkyl derivatives, action of ammonia and aniline on (DE BOLLEMONT), A., i, 131.
 esters and salts of (DE BOLLEMONT), A., i, 116, 117.
- Hydroxyamidines** (LEY), A., i, 759.
- 2-Hydroxy-3-*o*-amino-** and **3-*o*-hydroxyphenylquinoxaline** and its sulphonic acid and salts, and their 6 (or 7)-methyl derivatives (MARCHLEWSKI and Sosenowski), A., i, 415.
- 7-Hydroxyanthydro-2:4-dimethyl-1:4-benzopyranol** and its acetyl derivative, hydrochloride and picrate (BÜLOW and WAGNER), A., i, 400.
- 5-Hydroxy-6-anilino- $\alpha\beta$ -naphthaphenazine** and its diacetyl derivative (LINDENBAUM), A., i, 424.
- α -Hydroxyanisylideneacetophenone** and bromo- (POND and SHOFFSTALL), A., i, 36.
- Hydroxyazoaldehydes** (BORSCHIE and BOLSER), A., i, 572.

- Hydroxyazobenzene**, barium salt, hydrolytic dissociation of (FARMER), T., 866; P., 1901, 129.
- o*-**Hydroxyazobenzene**, synthesis of (BAMBERGER), A., i, 107.
- Hydroxyazo-colouring matters**, sulphonated, and their salts (SISLEY), A., i, 775.
- Hydroxyazo-compounds**, constitution of (McPHERSON and GORE), A., i, 572; (ORNDORFF and THEBAUD), A., i, 774.
- p*-**Hydroxyazo-compounds**, structure of, and condensation of, with benzhydrols (MÖHLAU and KEGEL), A., i, 56.
- m*-**Hydroxy-*o*-azotoluene**, *p*-diamino-, and its sulphate (ELBS and SCHWARZ), A., i, 619.
- o*-**Hydroxybenzaldehyde** resorcinol- and quinol-carbohydrazones (EINHORN and ESCALES), A., i, 653.
- p*-**Hydroxybenzaldehyde**, condensation of, with isobutaldehyde (HILDESHEIMER), A., i, 645.
- o*-**Hydroxybenzeneazo-*p*-toluene** (BAMBERGER), A., i, 107.
- o*-**Hydroxybenzoic acid**. See Salicylic acid.
- m*-**Hydroxybenzoic acid**, methyl ester (MEYER), A., i, 629.
- p*-**Hydroxybenzoic acid**, action of chlorine on (TARUGI), A., i, 146.
- 1-Hydroxy-2-benzoylcamphene** and its isomeride, and acetyl, metallic and phenylurethane derivatives; and crystalline form (FORSTER), T., 994; P., 1901, 167.
- o*-**Hydroxybenzoylformic acid** and its sodium salt (MARCHLEWSKI and SOSNOWSKI), A., i, 615.
- 4-Hydroxybenzyl alcohol**, 3-chloro- and 3-nitro-, and their chlorides (STOERMER and BEHN), A., i, 726.
- 2-Hydroxybenzylacetophenone** and its reduction (FEUERSTEIN and MUSCULUS), A., i, 279.
- Hydroxybenzylideneneindene** and its chloro-derivative (THIELE), A., i, 76.
- β*-**Hydroxybenzylglutaric acid** and its barium salt (FICHTER and SCHIESS), A., i, 545.
- o*-**Hydroxybenzylideneacetylpipecrone** (FEUERSTEIN and HEIMANN), A., i, 465.
- o*-**Hydroxybenzylideneaminophenylguanidine** nitrate, picrate, and platinichloride (PELLIZZARI and RICKARDS), A., i, 769.
- o*-**Hydroxybenzylideneaniline** and its bromo-derivatives (HANTZSCH and SCHWAB), A., i, 379.
- condensation of (SCHWAB), A., i, 380.
- p*-**Hydroxybenzylidenearbituric acid** and its potassium salt (WEINSCHENK), A., i, 528.
- o*-**Hydroxybenzylidenebenzamidine** and its salts (KUNCKELL and BAUER), A., i, 759.
- Hydroxybenzylidenecoumaranones**, 1-*o*- and 1-*p*-, syntheses of, and their 4-, 5-, and 6-methyl derivatives (STOERMER and BARTSCH), A., i, 94.
- Hydroxybenzylideneindanones**, *o*-, *m*-, and *p*- (FEUERSTEIN), A., i, 279.
- o*-**Hydroxybenzylidene-*o*-phenetidine** and *-o*-toluidine (JACOBSON and STEINBRECK), A., i, 380.
- o*-**Hydroxybenzylidenephénylglycolhydrazide** (CURTIUS and MÜLLER), A., i, 779.
- p*-**Hydroxybenzylidene-*o*- and *p*-toluidinesulphonic acids**, sodium salts (WALTER), A., i, 694.
- o*-**Hydroxybenzylidene-*o*-xylylenehydrazine** (FRÄNKEL), A., i, 45.
- α*-**Hydroxyisobutaldehyde**, condensation of, with acetaldehyde (ROESLER), A., i, 669.
- action of sodium hydroxide on (FRANKE), A., i, 188.
- α*-**Hydroxy-*β*-butenoic acid**, and its amide, nitrile, ethyl ester, dibromoderivatives and decomposition products (VAN DER SLEEN), A., i, 499.
- β*-**Hydroxybutylphenylthiocarbamide** (STRAUSS), A., i, 17.
- β*-**Hydroxybutyric acid**, estimation of, in urine (BERGELL), A., ii, 701.
- α*-**Hydroxyisobutyric acid**, bimolecular anhydride of (EINHORN and PFEIFFER), A., i, 712.
- 1-Hydroxycamphene**, and the action of sulphuric acid on (FORSTER), T., 651; P., 1901, 86.
- α*-**Hydroxycamphorcarboxylic acid**, and the action of heat on, and its amide and acetyl derivative (LAPWORTH and CHAPMAN), T., 382; P., 1901, 28.
- β*-**Hydroxycamphoronic acid** (LAPWORTH and LENTON), P., 1901, 148.
- 3-Hydroxycarbazole** and its diacetyl derivative (RUFF and STEIN), A., i, 620.
- 6-Hydroxy-5-carboxylamino-2-picoline-3-carboxylic acid** (ERRERA), A., i, 43.
- p*-**Hydroxycarboxyphenylhydrazonocyanacetic acid**, ethyl ester (LAX), A., i, 231.
- 7-Hydroxychromone** (v. KOSTANECKI, PAUL, and TAMBOR), A., i, 735.
- 7-Hydroxycoumarone-3-carboxylic acid** (*umbelliferone-3-carboxylic acid*) and its ethyl ester (v. PECHMANN and GRAEGER), A., i, 287.

- 7-Hydroxycoumarone-4-carboxylic acid, and its esters; and its acyl and 8-bromo-derivatives and their ethyl esters (V. PECHMANN and GRAEGER), A., i, 286.
- α -Hydroxycyanocamphor (LAPWORTH and CHAPMAN), T., 381; P., 1901, 28.
- Hydroxycytisine and its salts and acetyl derivative, and the action of sulphurous acid on (FREUND and FRIEDMANN), A., i, 288.
- γ -Hydroxydihydrocampholytic acid (NOYES and BLANCHARD), A., i, 664.
- Hydroxydiketohydrindene-carboxylic acid, ethyl ester (FLATOW), A., i, 543.
- 5-Hydroxy-7:2'-dimethoxy- and -diethoxy-flavones and their acetyl derivatives (V. KOSTANECKI and WEBEL), A., i, 479.
- Hydroxydimethylbutanetricarboxylic acids, lactones of (PERKIN and THORPE), T., 764; P., 1900, 150; 1901, 111.
- 7-Hydroxy-2:3-dimethylchromone and its acetyl derivative (V. KOSTANECKI and LLOYD), A., i, 736.
- Hydroxydimethylcoumarin, 3-chloro-, and its acetyl and benzoyl derivatives (V. PECHMANN and HANKE), A., i, 210.
- α -Hydroxy- $\beta\beta$ -dimethylglutaric acid, lactone of (PERKIN and THORPE), T., 758; P., 1901, 113.
- α -bromo-, lactone of, and ethyl ester (PERKIN and THORPE), T., 755; P., 1901, 112.
- β -Hydroxy- $\alpha\alpha$ -dimethylpropaldehyde, action of potassium hydroxide on (WESSELY), A., i, 256.
- 6-Hydroxy-2:4-dimethylpyridine, 3- and 5-cyano- (MOIR), P., 1901, 69.
- 6-Hydroxy 4:5-dimethylpyrimidine and its salts (SCHLENKER), A., i, 764.
- β -Hydroxy- $\alpha\alpha$ -dimethylvaleric acid, synthesis, properties, and salts of (SCHISCHKOWSKY and REFORMATSKY), A., i, 311.
- Hydroxydinaphthaphenazine oxide, bromo- and amino-, and the ethyl derivative of the amino-compound (LINDENBAUM), A., i, 424.
- 1-Hydroxydiphenyl acetate (HÖNIG-SCHMID), A., i, 700.
- Hydroxydiphenylacetic acid. See Benzilic acid.
- 4'-Hydroxydiphenylamine-6-carboxylic acid, 2:4-dinitro-, and its salts, and acetyl and benzoyl derivatives (COHN), A., i, 642.
- 7-Hydroxy-2:4-diphenylbenzodihydropyran and its acetyl derivative (BÜLOW and V. SICHERER), A., i, 604.
- 7-Hydroxy-2:4-diphenyl-1:4-benzopyranol and its salts, and 2:3-dibromo- and 8-nitroso- (BÜLOW and V. SICHERER), A., i, 603.
- β -Hydroxydiphenylethane, 2:4'-dinitro- α -cyano- (FREUND), A., i, 690.
- 2-Hydroxydiphenylsulphone (ULLMANN and PASDERMADJIAN), A., i, 383.
- 2-Hydroxy-4-ethoxybenzoylpyruvic acid, ethyl ester (V. KOSTANECKI, PAUL, and TAMBOR), A., i, 735.
- 2-Hydroxy-7-ethoxy-3-*o*-hydroxy-phenylquinoxaline (MARCHLEWSKI and SOSNOWSKI), A., i, 615.
- 1-Hydroxy-3-ethylamino-5:6:7:8-tetrachloroanthraquinone (HALLER and UMBROVE), A., i, 644.
- Hydroxyethylaminoformic acid, methyl and ethyl esters (FRANCHIMONT and LUBLIN), A., i, 674.
- Hydroxy-2-ethylchromones, 6- and 7-, and their acetyl derivatives (V. KOSTANECKI and TAMBOR), A., i, 558.
- Hydroxyethyl-dipropylamine, -diisobutylamine, and -diisocamylamine and their picrates and picrolonates (MATTHES), A., i, 513.
- Hydroxyethylglutaric acid and its salts (FITTING and ROTH), A., i, 121.
- γ -Hydroxyethylmalonic acid, ethyl esters, lactone of. See Butyrolactone-carboxylic acid.
- Hydroxyethylnitrocarbamide (FRANCHIMONT and LUBLIN), A., i, 674.
- Hydroxyethyl-propylamines, -*n*- and -*iso*-butylamines, -*iso*-camylamine, -heptylamine, and -hexylamine, and their salts and picrolonates (MATTHES), A., i, 259.
- Hydroxyfenchenic acids, isomeric, and their acetyl derivatives (WALLACH and NEUMANN), A., i, 333.
- 3'-Hydroxyflavone and its acetyl derivative (V. KOSTANECKI and TAMBOR), A., i, 558.
- 2-Hydroxyfluorene and its potassium salt and 2-Hydroxyfluorenone (DIELS), A., i, 522.
- γ -Hydroxycycloheptanecarboxylolactone (WILLSTÄTTER), A., i, 224.
- Hydroxyhexahydrobenzylamine derivatives (FARBWERKE VORM. MEISTER, LUCIUS, and BRÜNING), A., i, 692.
- Hydroxyhexahydroxylic acids, and their lactones (LEES and PERKIN), T., 344; P., 1898, 111; 1900, 18; (PERKIN and YATES), T., 1373.
- p*-Hydroxyhydratropic acid and its esters and derivatives (BOUGAULT), A., i, 389.
- Hydroxyhydrindene, amino- and nitro- (DÜNKELSBÜHLER), A., i, 44.

- 4-Hydroxyhydrindene (MOSCHNER), A., i, 374.
- 2-Hydroxy-3-*o*-hydroxyphenylquinoxaline (MARCHLEWSKI and SOSNOWSKI), A., i, 415, 615.
- 8-Hydroxy- α -hydroxyisopropylhexoic acid. See Cinogenic acid.
- Hydroxyketodihydrocyclogeranic acid (TIEMANN and TIGGES), A., i, 158.
- 6-Hydroxy-2-keto-3:4:4-trimethylhexamethylene, 1:6-dibromo- (CROSSLEY), T., 146; P., 1900, 91.
- κ -Hydroxy- ι -ketoundecoic acid, and its potassium salt, and semicarbazone and acetate (THOMS and FENDLER), A., i, 187.
- Hydroxylamine, action of, on the anhydrides of bromonitrocamphane (FORSTER), T., 653; P., 1901, 88.
- action of, on oxalacetic acid (FENTON and JONES), T., 94; P., 1900, 205.
- combination of, with ketones (PETRENKO-KRITSCHENKO and LORD-KIPANIDZE), A., i, 505.
- hydriodide (WOLFFENSTEIN and GROLL), A., ii, 551.
- estimation of, in presence of ammonia and nitrite (SULER), A., ii, 637.
- Hydroxylamines, new synthesis of (MOUREU), A., i, 317.
- β -aromatic, action of methyl on the velocity of reaction of the (BAMBERGER and RISING), A., i, 529.
- β -substituted, formation of (DUNSTAN and GOULDING), T., 629; P., 1901, 84.
- Hydroxylaminoisobutyric acid, ethyl-imino-ether, and amidine of (PILOTY and SCHWERIN), A., i, 517.
- Hydroxymaleic anhydride, pyridine salt of (WOHL and OESTERLIN), A., i, 365.
- Hydroxymercuribenzoic acid and anhydride, constitution of (PESCI), A., i, 576.
- p*-Hydroxy-*m*-methoxybenzylidene-indanone (FEUERSTEIN), A., i, 279.
- 1-Hydroxy-3-methoxycarbonyl-4-aminoxenol (BOSSE), A., i, 207.
- 5-Hydroxy-3-methoxy-*p*-xyloquinone and its 4-oxime and its salts (BOSSE), A., i, 207.
- β -Hydroxy- α -methylbutyric acid and its ethyl ester, and ester anhydride (KROMER), A., i, 629.
- 7-Hydroxy-2-methylchromone, and its acetyl derivative (v. KOSTANECKI and RÓŻYCKI), A., i, 223.
- 5-Hydroxy-7-methyldiketohydrindene. See Carminone.
- Hydroxymethylenecamphor-phosphinic acid and -oxychlorophosphine (MICHAELIS and FLEMMING), A., i, 439.
- Hydroxymethylenecyanoacetic acid. See β -Hydroxyacrylic acid, α -cyano-.
- Hydroxymethylenedihydroisophorone (FARBWERKE VORM. MEISTER, LUCIUS, and BRÜNING), A., i, 692.
- Hydroxymethyleneglutaconic acid. See Formylglutaconic acid.
- Hydroxymethylhexahydrobenzylaniline (FARBWERKE VORM. MEISTER, LUCIUS, and BRÜNING), A., i, 693.
- 8-Hydroxy- α -methylhexoic acid, barium salt (MOHR), A., i, 364.
- 2-Hydroxy-1-methyl-3-ketophenylpropenyl-5-benzeneazobenzene, and its sodium sulphonate (BORSCHKE and BOLSEI), A., i, 573.
- Hydroxymethyl-4-methylcoumarone (v. PECHMANN and HANKE), A., i, 211.
- Hydroxymethylmethylenecyclohexanone (FARBWERKE VORM. MEISTER, LUCIUS, and BRÜNING), A., i, 692.
- 5-Hydroxy-12-methylisopropylphenazonium-3-sulphonic acid, 10-chloro- (KEHRMANN and MÜLLER), A., i, 420.
- 2-Hydroxy-5-methylolbenzaldehyde and its ether, azine, and chloro-derivative (STOERMER and BEHN), A., i, 726.
- 4-Hydroxy-1-methylphenylmercuric salts (DIMKOTII), A., i, 440.
- Hydroxymethylisopropylhexahydrobenzyl-amines, -aniline, -dimethylamine, and -ethylamine (FARBWERKE VORM. MEISTER, LUCIUS, and BRÜNING), A., i, 692.
- 3-Hydroxymethylpyridine and its salts (DEHNEL), A., i, 164.
- β -Hydroxy- α -naphthaldehyde, and its oxime, phenylhydrazone, and hydrazides (FOSSE), A., i, 328.
- combination of, with camphor (HELBRONNER), A., i, 600.
- 5-Hydroxy- $\alpha\beta$ -naphthaphenazine, 6-bromo-, and its salts, acetyl derivative and ethyl ether (LINDENBAUM), A., i, 423.
- 6-Hydroxynaphthaphenazine, 5-amino-, and its acetyl derivative (KEHRMANN and BARCHE), A., i, 48.
- 2-Hydroxy-1:4-naphthaquinone, 7-amino-, and its imide (KEHRMANN and STEINER), A., i, 102.
- 8-amino-, and its acetyl derivative (KEHRMANN and MISSLIN), A., i, 423.
- 8-Hydroxy- α -naphthylamine-4-sulphonic acid and its sulphurous ether (BADISCHE ANILIN- and SODA-FABRIK), A., i, 699.

- 1-Hydroxynicotinic acid, methyl ester (MEYER), A., i, 629.
- 6-Hydroxy-2-*p*-nitrophenylpyrimidine-4-carbo-*p*-nitrobenzamide (RAPPEPORT), A., i, 568.
- Hydroxyoxamide, reactions of (PICKARD and CARTER), T., 842; P., 1901, 123.
- 7-Hydroxy-2-phenylanthydro-4-methyl-1:4-benzopyranol and its salts, acetyl derivative, methyl ether and anhydrobase (BÜLOW and WAGNER), A., i, 559.
- Hydroxyphenylcinnamic acid and its phenyl ester (BAKUNIN), A., i, 84.
- o*-Hydroxyphenylethyl alcohol and its mono- and di-urethane, and bromide (STOERNER and KAHLEIT), A., i, 535.
- 2- β -Hydroxy- β -phenylethyl-5-ethylpyridine, *p*-nitro-, and its salts (BACH), A., i, 610.
- 5- β -Hydroxy- β -phenylethyl-2-ethylpyridine, and *o*-nitro- and *o*-amino-, and their salts (CASTNER), A., i, 562.
- 2- β -Hydroxy- β -phenylethylpyridine (BACH), A., i, 610.
- and *o*-amino- and *p*-nitro-, and their salts (ROTH), A., i, 165.
- Hydroxyphenylmercuric salts (DIMROTH), A., i, 440.
- 7-Hydroxy-2-phenyl-4-methylbenzopyran and its acetyl derivative (BÜLOW and WAGNER), A., i, 559.
- 6-Hydroxy-2-phenyl-4-mono- and -4:5-dimethyl-, -4:5-methylethyl-, and -5:4-benzylmethyl-pyrimidines, and their *p*-nitro- and *p*-amino-derivatives (RAPPEPORT), A., i, 567.
- Hydroxyphenylmethyluracil, dibromo- (BEHREND, MEYER, and BUCHHOLZ), A., i, 137.
- 6-Hydroxy-3-phenyl- ψ -phenanthroline and its 2-carboxylic acid, and 6-bromo-, 6-chloro- and 6-iodo-derivatives (WILLGERODT and JABLONSKI), A., i, 50.
- 6-Hydroxy-2-phenylpyrimidine-4-carboxylic acid, *p*-nitro-, and its salts (RAPPEPORT), A., i, 569.
- p*-Hydroxyphenyl-*m*-tolylamine, *p*-amino-, and its sulphonic acid (FARBWERKE VORM. MEISTER, LUCIUS, and (BRÜNING), A., i, 755.
- Hydroxyisophthalic acid (LAWRENCE and PERKIN), P., 1901, 47.
- 6-Hydroxy-2-picoline, and 3:5-dibromo-, and its 3:5-dicarboxylic acid (ERRERA), A., i, 43.
- 6-Hydroxy-2-picoline-3-carboxylic acid, 5-cyano-, ethyl ester, and its potassium salt (ERRERA), A., i, 43.
- Hydroxypilocarpinic acid, salts of (JOWETT), T., 596; P., 1901, 57.
- Hydroxypivalic acid (WESSELY), A., i, 256.
- β -Hydroxypropaldehyde, α -chloro-. See Glyceraldehyde chlorohydrin.
- α -Hydroxypropionic acid. See Lactic acid.
- α -Hydroxy- α -*n*- and *iso*-propoxy- $\beta\beta\beta$ -trichloroethanes (*chloral propylates*) (GABUTTI), A., i, 367.
- 2-Hydroxy-5-*isopropyl*-1:4-benzoquinone, 3:6-dibromo- (HOFFMANN), A., i, 474.
- 7-Hydroxy-2-propylchromone, and its acetyl derivative (V. KOSTANECKI, TAMBOR, and WINTER), A., i, 559.
- α -Hydroxyisopropylhexoic acid, δ -bromo- (RUPE and RONTUS), A., i, 578.
- γ -Hydroxypropylmalonic acid, δ -dichloro-, lactone of. See γ -Valerolactone- α -carboxylic acid, δ -chloro-.
- β -Hydroxypropyl-3-methylpyrazolone, 4- γ -chloro- (TRAUBE and LEHMANN), A., i, 502.
- 2-Hydroxy- β -*p*-isopropylphenylethylpyridine and its salts (BACKE), A., i, 562.
- β -Hydroxypropylphenylthiocarbamide (STRAUSS), A., i, 17.
- Hydroxyquinol and tribromo-, dibromo-nitro-, and nitro-, tribenzoyl and triacetyl derivatives (THIELE and JAEGER), A., i, 701.
- triethyl ether. See 1:2:4-Triethoxybenzene.
- See also 1:2:4-Trihydroxybenzene.
- Hydroxyquinolcarboxylic acid and its triacetyl derivative (THIELE and JAEGER), A., i, 701.
- Hydroxyquinoline, chloroiodo- (BASLER CHEMISCHE FABRIK), A., i, 750.
- 2-Hydroxyquinoline. See Carbstyrl.
- 4-Hydroxyquinoline. See Kynurin.
- 4-Hydroxyquinoline-2-carboxylic acid (CAMPS), A., i, 751.
- 4-Hydroxyquinoline-3-carboxylic acid. See Kynurenic acid.
- 7-Hydroxy-2-quinolone-4-acetic acid and its ethyl ester (BESTHORN and GARBEN), A., i, 97.
- Hydroxyquinolphthalein. See Dihydroxyfluorescein.
- 4-Hydroxy-*o*-quinone bisphenylhydrazone (ORNDORFF and THIEBAUD), A., i, 775.
- Hydroxyroccelic acid (HESSE), A., i, 596.
- m*-Hydroxysulphobenzoic acid, *p*-amino-, methyl hydrogen ester, and its salts (JACOB), A., i, 31.
- Hydroxytetrahydrofurfuran-2:5-dicarboxylic acid, α -chloro- (HILL and WHEELER), A., i, 556.

4-Hydroxy-2:2:6:6-tetramethylpiperidine (*triacetonecalkamine*), stereoisomeric phenylcarbamides of (GROSCHUFF), A., i, 745.

3-Hydroxytetramethylpyrrolidine (PAULY and BOEHM), A., i, 607.

Hydroxytolualdehyde, ω -bromo- (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 727.

haloid derivatives, condensation of, with amines (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 713.

condensation products of, with phenols (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 712.

2-Hydroxy-*m*-tolualdehyde, 5-bromo-, and its phenylhydrazone, and **2-Hydroxy-*m*-toluic acid** and its barium salt (BORSCHKE and BOLSER), A., i, 573.

Hydroxytoluic acid, haloid derivatives, condensation of, with amines (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 713.

condensation products of, with phenols (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 712.

p-**Hydroxytolylidiphenylacetic acids**, and lactones and bromolactones of the *m*- and *p*-acids, and diacetyl derivative of the *m*-acid (BISTRZYCKI and NOWAKOWSKI), A., i, 717.

Hydroxytriazoles and their sulphonic acids, preparation of (OEHLER), A., i, 768.

Hydroxytrimethylhexahydrobenzyl-aniline (FARBWERKE VORM. MEISTER, LUCIUS, and BRÜNING), A., i, 692.

4-Hydroxy-2:6:6-trimethylpiperidine (α -*vinylidiacetonecalkamine*), and its stereoisomeric phenylcarbamides and their hydrochlorides (GROSCHUFF), A., i, 745.

p-**Hydroxytriphenylacetic acid** and its salts and dibromo- and nitro-derivatives (BISTRZYCKI and NOWAKOWSKI), A., i, 716.

p-**Hydroxytriphenylacetic acetic anhydride**, dibromo- (BISTRZYCKI and NOWAKOWSKI), A., i, 717.

p-**Hydroxytriphenylcarbinol**, and its acetyl, benzoyl and dibromo-derivatives (BISTRZYCKI and HERBST), A., i, 701.

p-**Hydroxytriphenyl ether** and its acetyl derivative and its dibromo-compound (BISTRZYCKI and HERBST), A., i, 702.

N-**Hydroxytriethylsulphamic anhydride** (MAMLOCK and WOLFFENSTEIN), A., i, 673.

Hydroxytrisdiketohydrindene and its isomeride (LIEBERMANN and LANDAU), A., i, 552.

Hydroxytrimethoxycarminonecarboxylic acid and its methyl ester (LIEBERMANN and LANDAU), A., i, 545.

ω -**Hydroxyundecylic acid** (WALKER and LUMSDEN), T., 1193.

δ -**Hydroxy- γ -valerolactone- α -carboxylic acid**, ethyl ester (TRAUBE and LEBMANN), A., i, 502.

Hyoscyne and ψ -**Hyoscyamine** from mandragora root (HESSE), A., i, 741.

Hyoscyamine from *Hyoscyamus muticus* and *Datura Stramonium* grown in Egypt (DUNSTAN and BROWN), T., 71; P., 1900, 207.

conversion of, into atropine (MAZZUCHELLI), A., i, 161.

relation of, to atropine (GADAMER), A., i, 605.

Hyper-acids, thermochemistry of (PISSARJEWSKY), A., ii, 56.

Hypersthenes from Ceylon (COOMÁRA-SWÁMY), A., ii, 171.

Hyphomicrobium, assimilation of carbon-dioxide by (STÜTZER), A., ii, 267.

Hypochlorous acid. See under Chlorine.

Hypophosphorous acid. See under Phosphorus.

I.

Ianthone, and its isomeride (DURAND, HUGUENIN & Co. and PHILIPPE BARBIER), A., i, 727.

Ichthulin and **Ichthulic acid** from cod (LEVENE), A., i, 433.

Imbricacic acid from lichens (ZOPF), A., i, 547.

Imidosulphites (DIVERS and OGAWA), T., 1099; P., 1900, 113; 1901, 163.

Iminazoles. See Glyoxalines.

Imino-ethers, formation of (LANDER), T., 690; P., 1901, 59.

aliphatic, preparation of, from amides (LANDER), T., 701; P., 1901, 61.

Iminopyrine (MICHAELIS and GUNKEL), A., i, 352.

Inanition, proteid katabolism in (VOIT), A., ii, 459.

cause of the increase of proteid decomposition during (KAUFMANN), A., ii, 254; (SCHULZ), A., ii, 562.

excretion of phosphorus during (SCHULZ and MAINZER), A., ii, 407.

Incineration, apparatus and method for exact (WISLIGENUS), A., ii, 622.

Indacene and its derivatives (EPHRAIM), A., i, 688.

- Indanedione** (*diketohydrindene*), derivatives of (NÖLTING and BLUM), A., i, 728.
- Indazole** and chloro-, and acetyl and nitroso-derivatives of the chloro-compound (FISCHER and SEUFFERT), A., i, 411.
- Indene**, condensation products of (THIELE), A., i, 76.
- Indeneoxalic acid** (THIELE), A., i, 76.
- Indene-resins** (KRAEMER and SPILKER), A., i, 557.
- Indiarubber**. See Caoutchouc.
- Indiazoneoxime** and its dibromo- and dichloro-derivatives (BAMBERGER and DEMUTH), A., i, 391.
- Indican**, detection of, in urine containing iodides (KÜHN), A., ii, 487.
estimation of, in urine (BOUMA), A., ii, 487.
estimation of, in urine, and its clinical significance (WOŁOWSKI), A., ii, 293.
- Indicanuria**, the urine in (KOBERT), A., ii, 68.
- Indicator**, new, for determining the acidity of wines, &c. (RUNYAN), A., ii, 629.
ferrisalicylic acid as an (GEROCK), A., ii, 190.
- Indicators**, acid and alkali, classification of (WAGNER), A., ii, 419.
for use with artificial light (KUFFERATH), A., ii, 684.
action of vegetable alkaloids on certain (ASTRUC), A., i, 604.
- Indigo** and its derivatives, preparation of, from phenylglycine-*o*-carboxylic esters (CHEMISCHE FABRIK VON HEYDEN), A., i, 714.
conversion of anthranilic acid derivatives into (ERDMANN), A., i, 536.
- Indigos**, commercial, estimation of, colorimetrically (VAUBEL), A., i, 715.
- Indigo-blue**, and **Indigo-red**, molecular weight of (VAUBEL), A., i, 714.
- Indigo-carmine**, constitution of (VORLÄNDER and SCHUBART), A., i, 564.
- Indigofera tinctoria**, organic iron compounds in (SUZUKI), A., ii, 678.
- Indigotin** and its N-alkyl derivatives, preparation of (FARBWERKE VORM. MEISTER, LUCIUS, and BRÜNING), A., i, 714.
reduction of, in an anhydrous medium (BANZ), A., i, 593; (HABER), A., ii, 638.
- Indigo-white**, oxidation of, with oxygen (MANCHOT and HERZOG), A., i, 565.
condensation of, with formaldehyde (BADISCHE ANILIN- and SODA-FABRIK), A., i, 715.
- Indigo-white**, acyl derivatives of (VORLÄNDER, DRESCHER, and TELLER), A., i, 563.
- Indirubin**, indoxyl origin of (MAILLARD), A., ii, 407.
- Indium** (CHABRIÉ and RENGADE), A., ii, 242.
atomic weight of (BENOIST), A., ii, 308.
position of, in the classification of the elements (CHABRIÉ and RENGADE), A., ii, 102.
- Indium trichloride**, double salt of, with rubidium chloride (KLEY), A., ii, 626.
hydroxide and molybdate (RENZ), A., ii, 657.
sulphate, double salts of, with cesium and rubidium sulphates (CHABRIÉ and RENGADE), A., ii, 102.
- Indium organic compounds**:—
platinocyanide (RENZ), A., ii, 657.
- Indium**, detection and estimation of:—
microchemical test for (KLEY), A., ii, 626.
estimation of (RENZ), A., ii, 657.
- Indiumacetylacetone** (CHABRIÉ and RENGADE), A., ii, 103.
- Indoles**, formation of 3-nitro- from the 3-nitroso-derivatives (ANGELI and ANGELICO), A., i, 45.
- Indophenols**, absorption spectra of (LEMOULT), A., i, 232; (BAYRAC and CAMICHEL), A., i, 296; (CAMICHEL and BAYRAC), A., i, 296; ii, 297.
- Indoxyl** and **Indoxylic acid**, acetyl derivatives of (VORLÄNDER, DRESCHER, and TELLER), A., i, 563.
- Indoxyl derivatives**, detection of (VORLÄNDER and MEUSEL), A., i, 83.
- Inesite** from Mexico (CUMMINGS), A., ii, 65.
- Infants**, new-born, composition of, and of their ash (CAMERER and SÖLDNER), A., ii, 173; (DE LANGE), A., ii, 174.
mineral composition of (HUGOVNENQ), A., ii, 405.
See also Children.
- Infracampholenamide**, its oxidation, and dibromide and hydrobromide (FORSTER), T., 117; P., 1900, 211.
- Infracampholene**, amino-, and its salts, and benzoyl, carbamide and phenyl-carbamide derivatives (FORSTER), T., 119; P., 1900, 211.
- Infracampholenic acid** and its salts and dibromide (FORSTER), T., 103; P., 1900, 211.
- Inorganic chemistry**, plea for the more efficient study of (WINKLER), A., ii, 232.

Internal friction. See Viscosity.

Intestine, absorption in the (HÖBER), A., ii, 610.

small and large, absorption in the (REACH), A., ii, 667.

small, digestion in the (KUTSCHER and SEEMANN), A., ii, 667.

Intestinal putrefaction, influence of urotropine on (LOEBISCH), A., ii, 667.

Intracellular juices, apparatus for obtaining (ROWLAND), A., ii, 613.

Intramolecular migration and its explanation based on the intramolecular mobility of multivalent elements (ERLENMEYER), A., i, 357.

rearrangement of isaldoxime ethers (WEGENER), A., i, 152.

Inulin as a stimulant of gastric secretion (MARK-SCHNORF), A., ii, 402.

Invariants, theory of (GORDAN and ALEXÉEFF), A., ii, 13; (STUDY), A., ii, 497.

Inversion of cane-sugar. See Affinity.
of the optically active *ac*-tetrahydro- β -naphthylamines prepared by the aid of *d*- and *l*-bromocamphorsulphonic acids (POPE and HARVEY), T., 74; P., 1900, 206.

Invertase from yeast (SALKOWSKI), A., i, 180.

action of chemical agents on (BOKORNY), A., ii, 438, 568.

Invertebrates, marine, osmosis in (QUINTON), A., ii, 116.

Invertin (ISSAEW), A., ii, 262; (WRÓBLEWSKI), A., ii, 466, 617.

presence of, in grapes (MARTINAND), A., ii, 35.

Iodination by means of bromide and chloride of iodine (ZERNOFF), A., i, 185.

of alkylbenzenes (EDINGER and GOLDBERG), A., i, 22.

Iodine, organic, in the waters of Salsomaggiore (MONTANARI), A., ii, 664.

origin of, in the organism (BOURCET), A., ii, 520.

presence and localisation of, in the leucocytes of blood (STASSANO and BOURCET), A., ii, 518.

and the colour of iodine solutions (VAUBEL), A., ii, 446.

action of liquid ammonia, and of sodamide and liquid ammonia on (RUFF), A., ii, 16.

action of, on chlorine heptoxide and on perchloric acid (MICHAEL and CONN), A., ii, 152.

Iodine monochlorides, α - and β - (ODDO), A., ii, 648.

trichloride (ODDO), A., ii, 649.

Iodine:—

Hydriodic acid (*hydrogen iodide*), catalysis in the reaction between hydrogen peroxide and (BRODE), A., ii, 443; (MANCHOT and WILHELMS), A., ii, 658.

photochemical decomposition of (PINNOW), A., ii, 634.

Iodides, presence of, in crystalline rocks (GAUTIER), A., ii, 398.

absorption spectra of solutions of (HAGENBACH), A., ii, 434.

Iodic acid, preparation of (SCOTT and ARBUCKLE), T., 302; P., 1901, 2.

action of, on uric acid (BOUILLET), A., ii, 290.

Iodine, estimation and separation of:—
estimation of, in dressings (FRERICHS), A., ii, 42, 204.

rate of separation of, from hydriodic acid, influence of various agents on the (BRODE), A., ii, 443.

Iodine absorption number of fats and oils, absolute (TORTELLI and RUGGERI), A., ii, 47.

Iodoform, electrolytic formation of (ELBS and FOERSTER), A., i, 109.

decomposition of, in chloroform solution (SCHUYTEN), A., i, 3.

estimation of, in dressings (FRERICHS), A., ii, 42, 204.

Iodohæmin. See Hæmin.

Iodohæmoglobin. See Hæmoglobin.

Iodoxy-compounds, conversion of, into iodoso fluorides (WEINLAND and STILLE), A., i, 634.

Iodyrite from Broken Hill, New South Wales (SPENCER), A., ii, 394.

Ionone, isomeride of (TIEMANN and SCHMIDT), A., i, 157.

α -**Ionone,** constitution of (TIEMANN and SCHMIDT), A., i, 159.

Ions. See Electrochemistry.

Iridium, estimation and separation of, from platinum ore (LEIDIÉ), A., ii, 62; (LEIDIÉ and QUENNESSEN), A., ii, 695.

separation of, from rhodium (PICCINI and MARINO), A., ii, 392.

Iron from the standpoint of the phase rule (v. JÜPTNER), A., ii, 161.

and nickel, simultaneous deposition of, from mixed solutions of their sulphates (KÜSTER), A., ii, 555.

rate of solution of, in hydrochloric acid (CONROY), A., ii, 388.

rendering passive, passivity, and rendering active of (HEATHCOTE), A., ii, 445.

irregular distribution of sulphur in (BOLLING), A., ii, 124.

Iron, action of ammonia on, at high temperatures (BEILBY and HENDERSON), T., 1248; P., 1900, 190.

action of, in anæmia experimentally produced (MÜLLER), A., ii, 522.
in hens' eggs (HOFFMANN), A., ii, 608.

in human milk (JOLLES and FRIED-JUNG), A., ii, 671.

of normal urine (NICOLA), A., ii, 326.
relationship of, in the urine and in the blood (JOLLES and WINKLER), A., ii, 30.

Iron alloy with aluminium (BRUNCK), A., ii, 656.

Iron salts, catalytic action of (MANCHOT and WILHELMS), A., ii, 658.

action of alcohols on (DITZ), A., ii, 223.

nitride from the crater of Vesuvius (MATTEUCCI; GAUTIER), A., ii, 63.

preparation, properties and reactions of (FOWLER), T., 285; P., 1900, 209; (BEILBY and HENDERSON), T., 1249; P., 1901, 190.

heat of formation and constitution of (FOWLER and HARTOG), T., 299; P., 1900, 210.

peroxides (MANCHOT and WILHELMS), A., ii, 658.

silicides (LEBEAU; JOUYE), A., ii, 317.

Ferric salts, velocity of the reaction and polymolecular transformations between, and metallic iodides (SCHÜKAREFF), A., ii, 647.

physical and chemical changes in solutions of (SCHAER), A., ii, 603.

reduction of (MORGAN), A., ii, 694.

potassium thiocyanate as indicator in the reduction of (EBELING), A., ii, 424; (VOLHARD), A., ii, 580; (DE KONINCK), A., ii, 694.

chloride in aqueous hydrochloric acid, separation of, from other metallic chlorides by ether (SPELLER), A., ii, 350.

and nitrate, temperature coefficient of susceptibility of solutions of (MOSLER), A., ii, 643.

hydroxide, formation of (MATUSCHEK), A., i, 455, 584, 635, 636, 677.

solubility of, in ammonium salicylate (WOLFF), A., ii, 198.

cæsium nitrate (WELLS, BEARDSLEY, JAMIESON, and METZGER), A., ii, 653.

Iron :—

Ferric oxide, soluble alkali salts of (HABER and PICK), A., ii, 103; (PICK), A., ii, 554.

compound of (HABER and PICK), A., ii, 103; (HABER), A., ii, 555.

Ferrous salts, action of steam on (GAUTIER), A., ii, 171.

oxide, new method of preparing (FÉRÉE), A., ii, 513.

estimation of, in silicates (DE KONINCK), A., ii, 284.

ferric oxide (KAUFMANN), A., ii, 554.

oxythiocarbonate, presence of, in the water of the Rhone (CAUSSE), A., ii, 61.

Iron ores, titaniferous, separation of, in basic igneous rocks (VOGT), A., ii, 63, 319.

Steel from the standpoint of the phase rule (v. JÜPTNER), A., ii, 161.

Steel-making alloys, estimation of tungsten in (IBBOTSON and BREARLEY), A., ii, 199.

Steel, estimation of aluminium in (SPATZ), A., ii, 349.

estimation of carbon in (JOB and DAVIES), A., ii, 127; (SCHMITZ), A., ii, 691.

apparatus for the estimation of carbon in (GÜCKEL), A., ii, 39.

estimation of nickel in (NORRIS), A., ii, 580.

estimation of phosphorus in (IBBOTSON and BREARLEY), A., ii, 343.

estimation of sulphur in (AUCHY), A., ii, 420; (NOYES and HELMER), A., ii, 687.

estimation of tungsten in (IBBOTSON and BREARLEY), A., ii, 199.

Schöffel's process for estimating tungsten in (BAGLEY and BREARLEY), A., ii, 200.

Iron compounds, organic, occurrence of, in plants (SUZUKI), A., ii, 678.

Iron (in general), estimation and separation of :—

estimation of, by potassium-iodide-iodate mixture (STOCK and MAS-SACIU), A., ii, 284.

estimation of, volumetrically, by means of stannous chloride (ZENGLIS), A., ii, 533.

estimation of bivalent, influence of pyrites and other sulphides on the (DE KONINCK), A., ii, 284; (HILLEBRAND and STOKES), A., ii, 424.

estimation of, in "Ferrum oxydatum saccharatum" (GÖHLICH), A., ii, 132.

Iron (in general), estimation and separation of:—

estimation of metallic, in reduced iron (MARQUARDT), A., ii, 693.

estimation of, in magnetite ores by the specific gravity test (RICHARDS), A., ii, 132.

estimation of, in human urine (HOFFMANN), A., ii, 326.

estimation of carbon in (SCHMITZ), A., ii, 691.

apparatus for the estimation of carbon in (GÖCKEL), A., ii, 39.

estimation of phosphorus in (IBBOTSON and BREARLEY), A., ii, 343.

estimation of sulphur in (AUCHY), A., ii, 420; (NOYES and HELMER), A., ii, 687.

*iso***Iron**e from bearswort oil (HAARMANN & REIMER), A., i, 727.

Iron-spar, estimation of small quantities of zinc in (FLATH), A., ii, 625.

Isatin and its derivatives (MARCHLEWSKI and SOSNOWSKI), A., i, 415, 615; (MARCHLEWSKI and RADCLIFFE), A., i, 416.

action of, on *o*-phenylenediamine (MARCHLEWSKI and BURACZEWSKI), A., i, 347.

Isatin, chloro-, from albumin (GNEZDA), A., i, 780.

Isinglass, new test for (HENZOLD), A., ii, 52.

Isobaric aqueous solutions (GROSHANS), A., ii, 644.

Isomeric change (LAPWORTH), T., 1265; P., 1901, 2.

Isomorphism between the salts of bismuth and the rare earths (BODMAN), A., ii, 454.

Iulus terrestris, a volatile venom from the skin of (PHISALIX; BÉHAL and PHISALIX), A., ii, 69.

Ivy as a calcareous plant (v. KLENZE), A., ii, 185.

J.

Jalapic acid, decacetyl derivative of (KROMER), A., i, 647.

Jalapin, action of barium hydroxide on (KROMER), A., i, 629.
pentacetyl derivative of (KROMER), A., i, 647.

Jams, composition of (TOLMAN, MUNSON, and BIGELOW), A., ii, 538.

Japaconitine, physiological action of (CASH and DUNSTAN), A., ii, 613.

Jasmine blossoms, oil of (HESSE), A., i, 220, 732; (ERDMANN), A., i, 601.

Jellies, composition of (TOLMAN, MUNSON, and BIGELOW), A., ii, 538.

LXXX. ii.

Juniper, empyreumatic oil of (CATHELIN-EAU and HAUSER), A., i, 283.

Juroresen (TSCHIRCH and BRÜNING), A., i, 91.

Jute, pentosans of (SCHÖNE and TOLLENS), A., ii, 414.

K.

Kainite, formation of, at 25° (VAN'T HOFF and v. EULER-CHELPIN), A., ii, 249; (VAN'T HOFF and MEYER-HOFFER), A., ii, 396.

Kairoline (*methyltetrahydroquinoline*), action of methyl iodoacetate on (WEDEKIND), A., i, 640.

Karabin from *Nerium odorum* (BOSE), P., 1901, 92.

Katabolism, decomposition of carbanilide by (BEYERINCK), A., ii, 264.

Kauric acid, α - and β -**Kaurolic acids**, **Kaurinolic acids**, and **Kauroresen** from Kauri copal (TSCHIRCH and NIEDERSTADT), A., i, 398.

α -**Ketoangelicalactone** phenylhydrazone and its isomeride (WOLFF and HEROLD), A., i, 504.

Ketobutylidenebistetronic acid (WOLFF and GABLER), A., i, 234.

Ketocoumaran. See **Coumaranone**.

4-Ketodihydroquinazolines, synthesis of (GOTTHELF), A., i, 764.

ζ -**Keto- β -dimethyloctic acid** (LESER), A., i, 278.

2-Ketohexahydroindazole (DIECKMANN), A., i, 542.

Ketohexyltetric acid (WOLFF and GABLER), A., i, 285.

α -**Keto- γ -hydroxybutane- $\alpha\gamma$ -dicarboxylic acid** and its salts and phenylhydrazone (DE JONG), A., i, 446.

γ -lactone of. See α -**Ketovalerolactone- γ -carboxylic acid**.

Ketohydroxy-ethoxy- and -isobutoxy-dihydropentanthrenedicarboxylic acids, bromo-, ethyl esters (LIEBERMANN and LANSER), A., i, 467.

Ketomenthone, $C_{10}H_{18}O$ (KONDAKOFF and BACHTSCHÉEFF), A., i, 334.

Ketomethane derivatives, addition of, to unsaturated compounds (VORLÄNDER), A., i, 84.

Ketone from oil of cassia flowers (SCHIMMEL & Co.), A., i, 394.

$C_7H_{12}O$, and its semicarbazone, from the reduction of tropilen (WILLSTÄTTER), A., i, 650.

$C_7H_{12}O_2$, from the oxidation of the ketoglycol, $C_8H_{16}O_3$, from dihydro-myrcene (SEMMER), A., i, 732.

$C_8H_{12}O$, from sorbic acid (DOEBNER and WOLFF), A., i, 578.

Ketone, $C_9H_{16}O_2$, from the oxidation of *i*-terpineol (SCHIMMEL & Co.), A., i, 395.

$C_{10}H_{12}O_2$, from *p*- ψ -propenylanisole (BÉHAL and TIFFENEAU), A., i, 273.

Ketones, preparation of, by the action of alkyl haloids and alkylcarbimides on nitriles in presence of magnesium or zinc bromides (BLAISE), A., i, 133.

influence of light on the interaction of, with alcohols (CIAMICIAN and SILBER), A., i, 329.

specific difference between aldehydes and (OECHSNER DE CONINCK and SERVANT), A., i, 126.

acidimetry of (ASTRUC and MURCO), A., i, 66.

action of benzamidine and *p*-tolenylamidine on (KUNCKELL and BAUER), A., i, 758.

action of, on ethyl cyanoacetate (GUARESCHI), A., i, 341; (PEANO), A., i, 346.

action of diazobenzene on (BAMBERGER and MÜLLER), A., i, 778.

and ethyl malonate, action of sodium ethoxide on a mixture of (STOBBE), A., i, 549.

condensation of, with ethyl isonicotinate (TSCHERNE), A., i, 749.

compounds of, with complex acids (v. BAeyer and VILLIGER), A., i, 659.

compounds of, with aminophenylguanidine (PELLIZZARI and RICKARDS), A., i, 769.

combination of, with phenylhydrazine and hydroxylamine (PETRENKO-KRITSCHENKO and LORDKIPANIDZÉ), A., i, 505; (PETRENKO-KRITSCHENKO and ELTSCHANINOFF), A., i, 506.

acetylenic (MOUREU and DELANGE), A., i, 352.

decomposition of, by alkalis (MOUREU and DELANGE), A., i, 14.

chlorinated hydroxy-, action of alkalis on (BRUNS), A., i, 216.

α -3-unsaturated, addition of, to diethyl succinate (STOBBE), A., i, 147, 276.

Ketones and Quinones. See also:—

4-Acetoacetylpyridine.

Acetone.

Acetonylacetone.

Acetonylisoamphor.

Acetophenone.

1-Acetoxy-2-benzoylcamphene.

Acetoxyethylideneacetone.

p-Acetylacetanilide.

Acetylacetone.

Acetylaminoethoxyacetophenone.

Ketones and Quinones. See:—

Acetylaminohydroxyacetophenone.

5-Acetylamino-1:2-naphthaquinone.

Acetyldiphenyl.

3-Acetyl-7-ethoxy-2-methylchromone.

2-Acetylfurfuran.

α -Acetylheptinene.

Acetylhexoylmethane.

Acetylmesitylene.

Acetylmethylcyclohexanone.

2:3-Acetylmethylquinoxaline.

Acetylphenylethylideneoxy γ -cyclotri-
azan.

Acetylpipecrone.

Acetyltrimethyl-lotoflavin.

Acridone.

α -Amylanhydracetonebenzil.

2-isoAmyl-4-ketodihydroquinazoline.

Anhydracetonebenzil.

Anil, chloro- and bromo-.

Anilindibenzoylthane.

Anilinomethylenedihydroisophorone.

Anilinomethylmethylenecyclohexan-
one.

2-Anilino-5-isopropyl-1:4-benzoquin-
one.

Anisylideneacetophenone.

Anisyl methyl ketone.

Anthradiquinones.

Anthragallol.

Anthraphenone.

Anthrapurpurin.

Anthraquinone.

Antipyrine.

Apigenin.

Benzamidinoisobutyrophenone.

Benzeneazo- α -ketoglutarimide.

Benzeneazophenylacetylacetophenone.

Benzil.

4-Benzoylacetylpyridine.

Benzophenone.

o-Benzoquinone.

Benzoquinonephenylhydrazonetetra-

methyl γ -diaminodiphenylmethane.

Benzoylanisoylmethane.

α -Benzoylcamphor.

Benzoyldiacetylthane.

α -Benzoylheptinene.

Benzoylhexoylmethane.

1-Benzoylpyridazone.

1-Benzoxy-2-benzoylcamphene.

Benzylantipyrine.

Benzylethylaminoanthraquinone.

Benzylideneacetone.

Benzylideneacetophenone.

Benzylidene- α -amylanhydracetone-
benzil.

Benzylidenecamphor.

Benzylidene- α -ethylanhydracetone-
benzil.

α -Benzylidenehydrindone.

Benzylideneindanedione.

Ketones and Quinones. See:—

Benzylidenementhone.
Benzylidene- α -methylanthracetonebenzil.
Benzylidenepropiophenone.
Benzylidene- α -propylanhydracetonebenzil.
Benzyl isopropyl ketone.
2-Benzyl-2-*o*-tolylidiketohydrindene.
Bisphenylethylpyrazolone.
Bisphenylpropylpyrazolone.
2-*iso*Butyl-4-ketodihydroquinazoline.
 ω -Butyryl-2:4-diethoxyacetophenone.
Camphor.
Camphorquinone.
Carbanilphenylethylideneoxycyclo-triazan.
Carbofenchonone.
Carminone.
Carone.
Carvenone.
Carvone.
Carvotanacetone.
Chromones.
Coumaranone.
Coumarone.
Cumyl methyl ketones.
Cymyl chloromethyl ketone.
Deoxyalizarin.
Deoxyanthrapurpurin.
Deoxybenzoin.
Deoxyflavopurpurin.
Desylene-methyl and -ethyl ethyl ketones.
Dibenzoyldiphenylbutadiene.
s-Dibenzoylethylenes.
2:5-Dibenzoylfurfuran.
 $\alpha\gamma$ -Dibenzoylpropane.
Dibenzylideneacetone.
Dibenzyl ketone.
3:6-Dibutyl-2:5-diketopiperazines.
Dibutyryl.
2:4-Diethoxybenzoylmethylacetone.
Diethoxycarminone.
Diethylaminoanthraquinone.
3-Diethylamino-5:6:7:8-tetrachloroanthraquinone.
Diethylaminodihydroxyanthraquinone.
 $\alpha\beta$ -Diethylanhydracetonebenzil.
Diethyl diketone.
3:6-Diethyl-2:5-diketopiperazine.
Diethyl ketone.
 $\beta\beta$ -Diethylsulphone- γ - and - δ -methylpentane- δ - and - γ -ones.
 $\beta\beta$ -Diethylsulphonepentane- γ -one.
Diformazyl phenyl ketone.
Dihydroanthraphenone.
Dihydrotruxone.
mp-Dihydroxybenzylideneindanone.
Dihydroxydihydromesityl oxide.

Ketones and Quinones. See:—

o-Dihydroxyphenylhydroxy-*o*-quinone.
Dihydroxyquinone.
4- $\alpha\gamma$ -Diketobutylpyridine.
Diketohydrindene.
1:2-Diketocyclopentane.
4- $\alpha\gamma$ -Diketo- γ -phenylpropylpyridine.
2:6-Diketo-4-*iso*propylhexamethylene.
2:6-Diketo-3:4:4-trimethylhexamethylene.
o-Dimethoxybenzoin.
5:7-Dimethoxy-2'-ethoxyflavone.
5:7-Dimethoxy-3'-ethoxyflavone.
6:7-Dimethoxy-3-methylcoumarone.
5:7-Dimethoxy-3':4'-methylenedioxyflavone.
4-Dimethylaminobenzylideneindanedione.
p-Dimethylaminobenzylideneindanone.
Dimethylaminomethylenementhone.
4-Dimethylamino-1-phenyl-2:3-dimethyl-5-pyrazolone.
Dimethylanhydracetonebenzils.
1:3-Dimethylbenziminazalone.
6:8-Dimethyl-1:4-benzopyrone.
4:6-Dimethylcoumaranone.
Dimethylcoumarone.
3:6-Dimethyl-2:5-diketopiperazine.
1:4-Dimethyl-3-cyclohexanone.
Dimethylcyclohexenone.
Dimethylpurones.
Diphenylacetylacetoguanamine.
Diphenacyls.
 $\alpha\beta$ -Diphenyl- α -diethylthiolethane- β -one.
Diphenylcyclopentenolone.
1:4-Diphenyl-1:2:4-triazolone-3-thiomethane.
Dipropionyl.
Dipropyl diketone.
Di-*o*-tolylacetylacetoguanamine.
Dypnone.
Ethenyl-4-methylumbelliferone.
m-Ethoxyacetophenone.
Ethoxyaminoacetophenone.
 α -Ethoxyanisylideneacetophenone.
7-Ethoxychromone.
7-Ethoxy-2:3-dimethylchromone.
Ethoxy-2-ethylchromones.
3'-Ethoxyflavone.
Ethoxynaphthylideneamphor.
2-Ethoxy-5-*iso*propyl-1:4-benzokinone.
Ethylacetylacetone.
 α -Ethylanhydracetonebenzil.
Ethylideneacetone.
2-Ethyl-4-ketodihydroquinazoline.
Ethylloxalyl-*o*-aminoacetophenone.
1-Ethyl-2-quinolone.
Ethyl-*p*-quinone.

Ketones and Quinones. See:—

Fenchocamphorones.
 Fenchone.
 Fluorenone.
 Formazyl methyl ketone.
 Formyl-*o*-aminoacetophenone.
 Hexahydroxyanthraquinone.
*cyclo*Hexanone.
 8-Hydrazino-4-methylumbelliferone.
 Hydrocoumarone.
 Hydroxyacetophenones.
 Hydroxyacetylpaconol.
 α -Hydroxyanisylideneacetophenone.
 1-Hydroxy-2-benzoylcamphene.
 2-Hydroxybenzylacetophenone.
o-Hydroxybenzylideneacetylpipecrone.
 Hydroxybenzylidenecoumaranones.
 Hydroxybenzylideneindanones.
 7-Hydroxychromone.
 α -Hydroxycyanocamphor.
 5-Hydroxy-7:2'-diethoxyflavone.
 5-Hydroxy-7:2'-dimethoxyflavone.
 7-Hydroxy-2:3-dimethylchromone.
 1-Hydroxy-3-ethylamino-5:6:7:8-tetrachloroanthraquinone.
 Hydroxy-2-ethylchromones.
 3'-Hydroxyflavone.
 2-Hydroxyfluorenone.
 6-Hydroxy-2-keto-3:4:4-trimethylhexamethylene.
p-Hydroxy-*m*-methoxybenzylideneindanone.
 5-Hydroxy-3-methoxy-*p*-xyloquinone.
 7-Hydroxy-2-methylchromone.
 Hydroxymethylenedihydroisophorone.
 5-Hydroxy-7-methyldiketohydrindene (*carminone*).
 2-Hydroxy-1-methyl-3-ketophenylpropenyl-5-benzeneazobenzene.
 Hydroxymethyl-4-methylcoumarone.
 Hydroxymethylmethylenecyclohexanone.
 2-Hydroxy-1:4-naphthaquinone.
 2-Hydroxy-5-isopropyl-1:4-benzoquinone.
 7-Hydroxy-2-propylchromone.
 β -Hydroxypropyl-3-methylpyrazolone.
 Hydroxytrisdiketohydrindene.
 Ianthone.
 Indanedione.
 Ionone.
*iso*Irone.
 Ketocoumaran.
 4-Ketodihydroquinazolines.
 2-Ketohexahydroindazole.
 Ketomenthone.
 3-Keto-2-phenylhexahydroindazole.
 3-Keto-2-phenyl-4-methylhexahydroindazole.
 2-Ketotetrahydro-oxazole.
 3-Keto-2:2:5:5-tetramethylpyrrolidine.
 Lapachonone.

Ketones and Quinones. See:—

Laurenone.
 Limonenone.
 Lotoflavin.
 Luteolin.
 Δ^6 -Menthene-2-one.
 Menthone.
 Mesityl methyl ketone.
 Mesityl oxide.
 ω -*o*-Methoxybenzoyl-3-ethoxyacetophenone.
 2-Methoxybenzylacetophenone.
 7-Methoxy-2:3-dimethylchromone.
 6-Methoxy-2-ethylchromone.
 Methoxynaphthylidenecamphor.
 2-Methoxy-5-isopropyl-1:3-benzoquinone.
 Methylacetone.
 Methylacetylacetone.
 3-Methyl-2-isoamyl-4-ketodihydroquinazoline.
 Methylanthracetone-mono- and -dibenzils.
 Methyl *isobutenyl* ketone.
 3-Methyl-2-isobutyl-4-ketodihydroquinazoline.
 4-Methyl-2-isobutylcyclopentanone.
 Methylcoumaranones.
 Methyl dibenzoylmethane.
 Methyl γ -dihydroxybutyl ketone.
 Methyl diphenylcyclopentenone.
mp-Methylenedioxybenzylideneindanone.
 Methylenementhone.
 3-Methyl-2-ethyl-4-ketodihydroquinazoline.
 Methyl ethyl ketone.
 Methylheptenone.
 Methyl heptyl ketone.
 β -Methylcyclohexanone.
 β -Methylhydrindone.
 2-Methyl-4-ketodihydroquinazoline.
 Methyl nonyl ketone.
 8-Methyl-5-propyl-1:4-benzopyrone.
 3-Methyl-2-*n*- and -*iso*-propyl-4-ketodihydroquinazolines.
 3-Methyl-1-isopropylcyclopentanone.
 4-Methyl-3-propyl-5-pyrazolone.
 4-Methylpurone.
 4-Methylisopurone.
 3-Methyl-5-pyrazolone.
 1-Methylpyridone.
 Methylquinolones.
p-Methylquinophthalone.
 Methyl- $\alpha\beta$ -cyclotrimethylenedaphnetin.
 Methyl- $\alpha\beta$ -cyclotrimethylenecumbelliferone.
 4-Methylumbelliferone.
 α -Naphthaquinone-3-diketohydrindene.
 Naphthaquinones.

Ketones and Quinones. See :—

Naphthyl methyl ketones.
 Pentamethoxybenzoylacetophenone.
*cyclo*Pentanone.
 Phenacyl benzyl ketone.
 Phenacylidenebenzamidine.
 Phenacylidene-*p*-tolenylamidine.
 Phenacylphenacetin.
 Phenanthraquinone.
 Pheno- α -ketoheptamethylene.
 5-Phenoxy-1-phenylpyridazine.
 Phenylacetylacetophenone.
 1-Phenyl-4-benzyl-3-methylpyrazolone.
 α -Phenyl- γ -diethylsulphonebutane- α -one.
 2-Phenyl-1:3-dimethyl-1:3-dibenzoylpropane.
 1-Phenyldimethylpyrazolones.
 Phenyl ethyl ketone.
 1-Phenyl-3-ethylpyrazolone.
 2-Phenylhydrazine-4-methyl-5-ethylpyrimidone.
 2-Phenylhydrazine-4-methylpyrimidone.
 Phenyl-3-methyl-4-benzeneazo-5-pyrazolone.
 2-Phenylmethylhydrazine-4-methylpyrimidone.
 1-Phenyl-4-methyl-3-propyl-5-pyrazolone.
 1-Phenyl-3-methylpyrazolone.
 1-Phenyl-5-methylpyridazine.
 5-Phenyl-3-*isooxazolone*.
 Phenylpropylpyrazolones.
 Phenylthiodiazolone-thiomethane.
 Phorone.
 ω -Propionyldiethoxyacetophenones.
 Propiophenone.
*iso*Propyl *iso*amyl ketone.
 Propylanhydracetonebenzils.
*iso*Propylideneacetone.
 2-*n*- and -*iso*-Propyl-4-ketodihydroquinazoline.
 Propyl *isopropyl* ketone.
 3-Propyl-5-pyrazolone.
 Pulegone.
 Purone.
*iso*Purone.
 Pyridones.
 Pyridylchlorodihydroxyquinone.
 Pyridyl*di*chlorohydroxyquinone.
 Quinhydrone.
 Quinolones.
 Quinolylenephenylene ketone.
 Quinones.
 Quinonebenzoyl- α -naphthylhydrazine.
 Quinophthalone.
 Retenequinone.
*iso*Safraninone.
 Telluroacetylumene.

Ketones and Quinones. See :—

Telluromethyl ψ -cumyl, α -naphthyl, *p*-phenetyl and xylyl ketones.
 Tetracyltetramethylene.
 Tetradecylbenzoylacetyle.
 Tetrahydroxymethylantraquinone.
 2:4:6:4'-Tetramethoxybenzoylacetophenone.
 2:4:6:3'-Tetramethoxy-4'-ethoxybenzoylacetophenone.
 3:4-*cyclo*Tetramethylene-5-pyrazolone.
 1:2-*cyclo*Tetramethyleneumbelliferone.
 Tetramethylpurone.
 Tetraphenylcyclopentenolone.
 Thymoquinone.
 Thymoquinonebenzoyl- α -naphthylhydrazine.
p-Tolacylidenebenzamidine.
p-Tolacylidene-*p*-tolenylamidine.
 2-*p*-Toluidino-5-*isopropyl*-1:4-benzquinone.
 Tolu- γ -pyrones.
p-Toluquinone.
 Toluquinonebenzoyl- α -naphthylhydrazine.
p-Toluquinophthalone.
 2-*o*-Tolyldiketohydrindene.
 2-*o*-Tolyl-2-ethyldiketohydrindene.
 2-*o*-Tolyl-2-methyldiketohydrindene.
 5-*p*-Tolyl-3-methyleyclohexenone.
p-Tolyl methyl ketone.
p-Tolylthiodiazolone-thiomethane.
p-Tolylthiodiazolone-*p*-tolylthiomethane.
 Triacetoneamine.
m-Triazoacetophenone.
 Tribenzoylanthracene.
 Tribenzoyltetrahydroanthracene.
 5:7:2'-Trihydroxyflavone.
 Trihydroxyflavones.
 $\beta\gamma\delta$ -Triketopentane.
 2:4:6-Trimethoxybenzoyl-3'-ethoxyacetophenone.
 2:4:6-Trimethoxybenzoyl-3':4'-methylenedioxyacetophenone.
 2:4:6-Trimethoxy-2'-ethoxybenzoylacetophenone.
 5:7:3'-Trimethoxy-4'-ethoxyflavone.
 $\alpha\beta\beta$ -Trimethylanhydracetonebenzil.
 3:4-*cyclo*Trimethylenepyrazolone.
 1:4:6-Trimethylpurone.
 1:4:6-Trimethylisopurone.
 $\beta\zeta\mu$ -Trimethyltriskaideka- $\beta\zeta\theta\lambda$ -tetrene- κ -one.
 Tropinone.
 Truxone.
 Urethylcoumarone.
 Vinylacetoneamine.
m-Xylyl methyl ketone.
cyclo- β -Ketonecarboxylic esters (DIECKMANN), A., i, 539.

- Ketonic acid**, $C_8H_{12}O_3$, from the oxidation of fenchene (WALLACH and NEUMANN), A., i, 332.
- $C_{10}H_{18}O_3$, from the oxidation of cyclo-dihydromyrcene (SEMMLER), A., i, 732.
- Ketonic acids**, mercaptols from (POSNER), A., i, 703.
- β -Ketonic acids**, preparation of, by the action of alkyl salts of α -bromo-acids of the acetic series in presence of magnesium or zinc bromide (BLAISE), A., i, 133.
- δ -Ketonic acids**, simple synthesis of (STOBBE), A., i, 324.
- 3-Keto-2-phenylhexahydroindazole** and its 4-methyl derivative (DIECKMANN), A., i, 542.
- 2-Ketotetrahydro-oxazole**, nitro-derivative (FRANCHIMONT and LUBLIN), A., i, 674.
- 3-Keto-2:2:5:5-tetramethylpyrrolidine** and its nitrosamine, and cyanohydrin (PAULY and BOEHM), A., i, 607.
- α -Ketovalerolactone- γ -carboxylic acid** and its phenylhydrazone and β -bromo-, α -nitro- and benzoyl derivatives (DE JONG), A., i, 446; (WOLFF), A., i, 499; (WOLFF and HEROLD), A., i, 502.
- Ketoximes**, action of alkyl haloids on (DUNSTAN and GOULDING), T., 628; P., 1901, 84.
- Ketoximohydroxyethoxydihydropent-anthrene**, bromo- (LIEBERMANN and LANSER), A., i, 466.
- chloro- (BERTHEIM), A., i, 468.
- Keuper marl**, chemical and mineralogical constituents of (WÜLFING), A., ii, 113.
- Kidneys**, action of hesperidin and of phloridzin on the (v. KÜSSA), A., ii, 31.
- action of pituitary extract on the (MAGNUS and SCHAFER), A., ii, 612.
- composition of pus from a tumour in the (PATEIN and POYOU), A., ii, 566.
- Kipp's apparatus**, modification of (THIELE), A., ii, 546.
- Koswite** from the Urals (DUPARC and PEARCE), A., ii, 398, 664.
- "**v. Krottnaurer's patent manure**." See Agricultural Chemistry.
- Krypton**, isolation of, from air (DEWAR), A., ii, 597.
- separation and spectra of (LIVING and DEWAR), A., ii, 598.
- physical properties of (RAMSAY and TRAVERS), A., ii, 238.
- refraction of (RAMSAY), A., ii, 141.
- Kyanite** from Trpín, Moravia (KOVÁŘ), A., ii, 606.
- Kynurenic acid**, conversion of aminophenylpropionic acid into (CAMPS), A., i, 751.
- origin of, in the organism (GLAESSNER and LANGSTEIN), A., ii, 669.
- excretion of (MENDEL and SCHNEIDER), A., ii, 259, 565; (GIES), A., ii, 407.
- Kynurin (4-hydroxyquinoline)** (CAMPS), A., i, 751.
- physiological action of (v. FENY-VESSY), A., ii, 31.

L.

- Labradorite** from New South Wales (HARKER), A., ii, 320.
- Laccase** (SLOWTZOFF), A., i, 177.
- Lactase** of the pancreas (WEINLAND), A., ii, 30.
- Lactic acid** (*i-ethylidenlactic acid*; *α -hydroxypropionic acid*) in beet molasses (SCHÖNE and TOLLENS), A., i, 116.
- occurrence and estimation of, in wines (KUNZ), A., ii, 700.
- formation of, in the blood (ASHER and JACKSON), A., ii, 563.
- action of *Bacillus coli communis* on (HARDEN), T., 624; P., 1901, 58.
- formation of chloroform from (EBERHARD), A., i, 357.
- fermentation. See Fermentation.
- Lactic acid**, zinc salt, and menthyl ester (COHEN and WHITELEY), T., 1309; P., 1900, 213.
- d*-Lactic acid**, formation of, in the organism (SAITO and KATSUYAMA), A., ii, 405.
- post mortem* formation of (OSBORNE), A., ii, 460.
- Lactic anhydride**, estimation of, in lactic acid (KUNZ), A., ii, 428.
- Lactomucin** (LAJOUX), A., ii, 671.
- Lactone**, $C_8H_{14}O_2$, from the oxide $C_9H_{18}O_2$ (PETCHNIKOFF), A., i, 183.
- Lactones**, action of zinc ethyl on (GRANCHSTÄDTEN and WERNER), A., i, 518.
- Lactones**. See also:—
- β -Acetylglutaric acid, ketodilactone of.
- β -Acetyltrimethylglutaric acid, ketodilactone of.
- α -Acetyl- γ -valerolactone.
- Alantolactone.
- β -Benzoylglutaric acid, ketodilactone of.
- α -Benzoyl- γ -valerolactone.
- Benzyl- β -glutaric acid, ketodilactones of.

Lactones. See :—

- Benzylidene- β -acetylglutaric acid, ketodilactone of.
 Butyrolactonecarboxylic acid.
 β -Butyrylglutaric acids, ketodilactones of.
 Callitrolic acid, lactone of.
 Campholytolactone.
 Carboxyphenylbutyrolactoneacetic acid.
 Dihydroisovalantolactone.
 $\alpha\alpha$ -Dihydroxy- $\beta\beta$ -dimethylglutaric acid, lactone of.
 Diketovalerolactone- γ -carboxylic acid.
 Dimethylethylhydroxybutanetricarboxylic acid, lactone of.
 Dimethylethylhydroxybutanetricarboxylic acids, lactones of.
 $\beta\delta$ -Diphenylvalerolactoneacetic acid.
 L-Erythronic acid, lactone of.
 Glycuronolactone.
 Heptolactoneacetic acid.
*iso*Hexolactone.
 Hydroxydimethylbutanetricarboxylic acids, lactones of.
 Hydroxydimethylcoumarin.
 Hydroxy- $\beta\beta$ -dimethylglutaric acids, lactones of.
 γ -Hydroxyethylmalonic acid, lactone of.
 γ -Hydroxycycloheptanecarboxylolactone.
 Hydroxyhexahydroxylic acids, lactones of.
 γ -Hydroxypropylmalonic acid, lactone of.
 μ -Hydroxytolylidiphenylacetic acids, lactones of.
 δ -Hydroxy- γ -valerolactone- α -carboxylic acid.
 α -Ketoangelicalactone.
 α -Keto- γ -hydroxybutane- $\alpha\gamma$ -dicarboxylic acid, lactone of.
 α -Ketovalerolactone- α -carboxylic acid.
 Lichestrone.
 4-Methylresculetin.
 4-Methylcoumarin.
 4-Methyldaphnetin.
 β -Methylhexenolactone.
 α -Methyl- δ -hexolactone.
 β -Methylhexolactone- α -carboxylic acid.
 α -Methylævulolactone.
 4-Methylumbelliferone.
 Phenylbutyrolactoneacetic acid.
 β -Phthaloylglutaric acid, ketodilactone of.
*iso*Pilocarpinolactone.
 α -*iso*Propyl- β -*isobutyl*hydracrylic acid, lactone of.
 Stilbene-*o*-carboxylic acid, lactones of.

Lactones. See :—

- Trimethylhydroxybutanetricarboxylic acids, lactones of.
 Valerolactoneacetic acid.
 Valerolactonecarboxylic acids.
Lactose (*milk sugar*), detection of, in milk (RIEGLER), A., ii, 206.
 estimation of, in milk (RIEGLER), A., ii, 698.
 estimation of, by polarisation and reduction, in milk (SCHEIBE), A., ii, 204.
 estimation of, in condensed milk (S. H. R. and C. N. REIDER), A., ii, 355.
 β -Lactylcarbamide. See Hydrouracil.
Lævulose (*d-fructose*), action of *Bacillus coli communis* on (HARDEN), T., 621 ; P., 1901, 57.
Lambs. See Agricultural Chemistry.
Lamps for spectra (BECKMANN), A., ii, 53, 81.
Lanthanum, atomic weight of (BRAUNER and PAVLIČEK), P., 1901, 63.
 nitrite (MATIGNON), A., ii, 61.
Lapachonone, bromination of (MANUELLI), A., i, 216.
Lard, American, behaviour of, with Halphen's test (SOLTSIEN), A., ii, 292, 430.
Lassallite from Miramont (FRIEDEL), A., ii, 397.
Latent heats. See Thermochemistry.
Laumontite from the Caucasus (ZEMJAT-SCHENSKY), A., ii, 607.
Laurenone and its oxime and hydroxylamino-oxime (TIEMANN, KERSCHBAUM, and TIGGES), A., i, 7.
n-**Lauric anhydride.** See *n*-Dodecoic anhydride.
*iso***Lauronic acid.** See *iso*Campholytonic acid.
Launolic acid and its oxidation products (TIEMANN, KERSCHBAUM, and TIGGES), A., i, 6.
*iso***Launolic acid**, preparation of (LEES and PERKIN), T., 341 ; P., 1900, 18.
 constitution of (FORSTER), T., 110 ; (TIEMANN, KERSCHBAUM, and TIGGES), A., i, 6 ; (BLANC), A., i, 10.
 action of aluminium chloride on (LEES and PERKIN), T., 356.
 oxidation products of (TIEMANN, KERSCHBAUM, and TIGGES), A., i, 6.
*iso***Launonic acid**, ethyl ester, nitrate of (WAHL), A., i, 663.
 See also Campholytic acids.
Lead, radio-active (HOFMANN and STRAUSS), A., ii, 19, 159, 385, 655.
 electrolytic deposition of (GLASER), A., ii, 158.

- Lead**, melting point of (HOLBORN and DAY), A., ii, 85.
solid, diffusion of gold in, at the ordinary temperature (ROBERTS-AUSTEN), A., ii, 9.
- Lead amalgams** (FAY and NORTH), A., ii, 240.
- Lead salts**, behaviour of, in solution (V. ENDE), A., ii, 241.
- Lead fluoride**, behaviour of, in solution (JAEGER), A., ii, 386.
iodide and chloride, molten, electrolysis of (AUERBACH), A., ii, 590.
suboxide (TANATAR), A., ii, 451.
oxide, volatility of (STOERMER), A., ii, 654.
dioxide, estimation of, volumetrically, in red lead (LIEBIG), A., ii, 692.
silicates in pottery manufacture, solubility of (THORPE and SIMMONDS), T., 791; P., 1901, 113.
sulphate and double salts of, with alkalisulphates (ELBS and FISCHER), A., ii, 99.
sulpho-bromide, -chloride, and -iodide (LENIER), A., ii, 654.
- Lead organic compounds**:—
thiocyanate, action of, on the chloro-carbonates (DORAN), T., 906; P., 1901, 130.
- Lead, detection and estimation of**:—
detection of, in drinking waters (BELLOCQ), A., ii, 349.
estimation of, in cupriferous minerals with calcareous gangue (GUEROULT), A., ii, 130.
estimation of, in galena (WILLENZ), A., ii, 196.
estimation of soluble, in resinate-driers (HEFELMANN), A., ii, 532.
separation of, electrolytically, from manganese (MOLTKE-HANSEN), A., ii, 478.
- Leaves**. See Agricultural Chemistry.
- Lecithin** in brain and milk (BUROW), A., ii, 30.
optical activity of (ULPIANI), A., i, 491, 498.
influence of, on nutritive exchanges (CARRIERE), A., ii, 610.
of hens' eggs, influence of, in nutritive exchanges (DESGREZ and ZAKY), A., ii, 518.
influence of, on urinary constituents (ZAKY), A., ii, 673.
use of, in tuberculosis (CLAUDE and ZAKY), A., ii, 673.
- Ledouxite** from Mohawk mine, Michigan (RICHARDS), A., ii, 515.
- Leguminosæ**. See Agricultural Chemistry.
- "Leipzig poudrette."** See Agricultural Chemistry.
- Lemonal**, condensation of, with mesityl oxide (DURAND, HUGUENIN & Co. and PHILIPPE BARBIER), A., i, 727.
- Lemon camphor**. See Citraptene.
- Lemon juices**, composition and analysis of (SPAETH), A., ii, 584.
- Lemons**, oil of (BURGESS), P., 1901, 171; (THEULIER), A., i, 213; (V. SODEN), A., i, 733.
two new substances in (BURGESS), P., 1901, 171.
valuation of (WALTHER), A., ii, 49.
- Lepralin, Lepraridin, and Leprarinin** (ZOFF), A., i, 87.
- Leprarin-chloroform** (KASSNER), A., i, 283.
- Leucine**, derivatives of (FISCHER and FOURNEAU), A., i, 675.
i- and *l*-ethyl esters and their picrates and *i*-acetyl derivative (FISCHER), A., i, 193.
r-Leucine, synthesis of (ERLENMEYER and KUNLIN), A., i, 468.
l-Leucine and *d*-Leucinebenzenesulphonic acid (FISCHER), A., i, 193.
- Leucinimide**, formation of, from oxy-hæmoglobin and globin (SALASKIN), A., i, 622.
- Leuco-bases**, sensitiveness of, to light (GROS), A., ii, 433.
- Leucocytes**, presence and localisation of iodine in (STASSANO and BOURCET), A., ii, 518.
role of, in excretion (STASSANO), A., ii, 564.
- Leuco-eupittone** (*hexamethoxyyleucaurin*) and its triacetyl derivative (LIEBERMANN and WIEDERMANN), A., i, 384.
- Leuconic acid**, energy of (COFFETTI), A., i, 29.
- Licareol**, constitution of (BARBIER), A., i, 731.
- Lichenostearic acids**, α -, β -, and γ -, and **Lichestronic acid** and its lactone (HESSE), A., i, 86.
- Lichens** and their constituents (HESSE), A., i, 85, 149, 595; (ZOFF), A., i, 87, 546; (SALKOWSKI), A., i, 152.
- Ligament**, elastic, chemistry of (RICHARDS and GIES), A., i, 353.
- Light**, action of, on the development of etiolated plants (RICOME), A., ii, 120.
See also Photochemistry.
- Lilium bulbs**, mannose from (PARKIN), A., ii, 414.
- Lime**. See Calcium oxide.
- Limestone**, dolomitic, from Roumania (PONT), A., ii, 26.

- Limestones** of New York and their economic value (RIES), A., ii, 321.
- Lime trees.** See Agricultural Chemistry.
- ψ -Limonene** (SEMMLER), A., i, 331.
- Limonenol, Limonenone, and Limonenoxyime** (GENVRESSE), A., i, 281.
- Limonite** from Monte Valerio (MANNASSE), A., ii, 394.
- Linaloes oil** (SCHIMMEL & Co.), A., i, 395.
- Linseed meal.** See Agricultural Chemistry.
- Lipase** (KASTLE and LOEVENHART), A., i, 178 ; (LOEVENHART), A., ii, 253 ; (HANRIOT), A., ii, 562.
hydrolytic action of (KASTLE and LOEVENHART), A., i, 178 ; (HANRIOT), A., ii, 175, 324.
- Liquefaction** of gaseous mixtures (CAUBET), A., ii, 147, 148.
of a mixture of two gases (DUHEM), A., ii, 227.
of helium (DEWAR), A., ii, 597.
of hydrogen (TRAVERS), A., ii, 379.
of pressed yeast (HARDEN and ROWLAND), T., 1227 ; P., 1901, 189.
- Liquid precipitates**, invisible liquid layers and surface tension of (QUINCKE), A., ii, 646.
- Liquids**, refractive indices of mixtures of (DE KOWALSKI), A., ii, 537.
pure, dielectric constants of (TURNER), A., ii, 53.
partially miscible, remarkable phenomena near the critical point of (FRIEDLÄNDER), A., ii, 643.
relationship of viscosity of, to temperature and chemical constitution (BATSHINSKI), A., ii, 645.
and solutions, viscosity of mixtures of (LEES), A., ii, 148.
latent heat of evaporation of (CROMPTON), P., 1901, 61.
specific volume of, at infinite pressure (PAGLIANI), A., ii, 644.
distinction between chemical and physical supersaturation of, by gases (BERTHELOT), A., ii, 8.
organic, polymerisation of (GUYE and BAUD), A., ii, 437, 543.
boiling points of some (LONGINESCU), A., ii, 640.
apparatus for circulating, at constant temperature (DERBY), A., ii, 231.
apparatus for the extraction of, by ether or chloroform (OSBORNE), A., ii, 136.
- Lithium salts**, combination of, with ammonia in aqueous solution (DAWSON and McCRAE), T., 501 ; P., 1901, 6.
- Lithium chloride**, action of, on crops (VOELCKER), A., ii, 269.
- Lithium chloride**, compounds of, with ammonia and amines (BONNEFOI), A., ii, 653.
mercuric double iodide, nonohydrate of (DOBROSERDOFF), A., ii, 160.
- Lithium**, estimation of:—
estimation of, in water (RANZOLI), A., ii, 423.
- Liveingite** from the Binnenthal (SOILY and JACKSON), A., ii, 558.
- Liver**, studies on the (BÜRKER), A., ii, 178.
amylolytic ferment of the (PREMIL-LEUX ; DASTRE), A., ii, 325.
influence of asphyxia on the glycolytic function of the (SEEGER), A., ii, 522.
sugar formation in the (BIAL), A., ii, 608.
excretion of nitrogen after extirpation of the (LANG), A., ii, 407.
composition of liquid from a hydatid cyst of the (MALMÉJAC), A., ii, 408.
- Lobaric acid** (HESSE), A., i, 645.
- Locusts** as manure (HÜNCKEL D'HERCULAIS), A., ii, 342.
- London purple**, composition and analysis of (HAYWOOD), A., ii, 126.
- Lotase, Lotoflavin** and its tetracetyl derivative and trimethyl ethers, and **Lotusin** (DUNSTAN and HENRY), A., i, 39, 647.
- Lotus arabicus**, nature and origin of the poison of (DUNSTAN and HENRY), A., i, 39, 647.
- Lotusinic acid** (DUNSTAN and HENRY), A., i, 647.
- Luffa**, pentosans of (SCHÖNE and TOLLENS), A., ii, 414.
- Luminosity** caused by liquid hydrogen (DEWAR), A., ii, 593.
obtained with certain organic compounds (DUBOIS), A., ii, 217.
- Lung**, autolysis of the (JACOBY), A., ii, 670.
- Lupetidine** and *iso*Lupetidine (2:6-dimethylpiperidines), and their benzoyl, phenylcarbimide, phenyl-thiocarbimide, and benzenesulphonic derivatives (MARCUSE and WOLFFENSTEIN), A., i, 608.
- Lupetidine**, combination of, with hydrogen peroxide (MARCUSE and WOLFFENSTEIN), A., i, 608.
- Lupinus albus.** See Agricultural Chemistry.
- Lupulinic acid**, $C_{25}H_{26}O_4$, and the α -acid, and the acid $C_{15}H_{20}O_3$ from it (BARTH), A., i, 40.
- Luteo-cobalt compounds.** See under Cobalt.

- Luteolin**, synthesis of (V. KOSTANECKI, RÓŻYCKI, and TAMBOR), A., i, 92; (V. KOSTANECKI), A., i, 335; (DILLER and V. KOSTANECKI), A., i, 476.
 constitution of (V. KOSTANECKI), A., i, 335.
 methyl ether of (DILLER and V. KOSTANECKI), A., i, 476.
Lutidine, compounds of, with metallic salts (TOMBECK), A., i, 164, 266.
 See also Dimethylpyridines.
 α -**Lutidine**, compounds of, with cupric salts (TOMBECK), A., i, 267.
 ψ -**Lutidostyryl** and its 3:5-dibromo- and 3- and 5-nitro-derivatives (MOIR), P., 1901, 69.
Lymph, properties and origin of (ASHER and BUSCH), A., ii, 29.
 calcium and sodium citrates in the coagulation of (SABBATANI), A., ii, 175.
Lymph hearts of the frog, effect of ions on the contraction of the (MOORE), A., ii, 257.

M.

- Magnesium**, polarisation of, in alkaline solutions (CAMPETTI), A., ii, 590.
 reducing properties of (DUBOIN), A., ii, 315.
 change in the chemical properties of, when alloyed with mercury (LE BON), A., ii, 20.
Magnesium alloys with aluminium (BOUDOFARD), A., ii, 512.
Magnesium aluminate (DUFAY), A., ii, 553.
 borate (OUVRARD), A., ii, 158.
 chloride, double salt of, with antimony pentachloride (WEINLAND and SCHLEGELMILCH), A., ii, 661.
 and potassium chlorides and sulphates, maximum vapour pressure of solutions of, at 25° (VAN'T HOFF and V. EULER-CHELPIN), A., ii, 249.
 indate (RENZ), A., ii, 657.
 nitride, formation of (KIRCHNER), A., ii, 450.
 formation of, by heating magnesium in air (EIDMANN and MOESER), A., ii, 240.
 pyrophosphate, bleaching of, by conversion into the pyrosulphophosphate (PELLER), A., ii, 532.
 potassium acid sulphate, $\text{KHMg}(\text{SO}_4)_2 + 2\text{H}_2\text{O}$ (MEYERHOFFER and COTTRELL), A., ii, 552.
Magnesium organic compounds (GRIGNARD), A., i, 263; (TISSIER and GRIGNARD), A., i, 316, 440.
Magnesium organic compounds, synthesis of acids, alcohols, and hydrocarbons by means of (GRIGNARD), A., i, 679.
 action of acid anhydrides and chlorides on (TISSIER and GRIGNARD), A., i, 316.
 action of, on alkyl esters (BÉHAL), A., i, 246; (MASSON), A., i, 249; (GRIGNARD), A., i, 250.
 action of esters of dibasic acids on (VALEUR), A., i, 317.
 action of, on naphthyl methyl ketones (GRIGNARD), A., i, 393.
 ethereal derivatives of (BLAISE), A., i, 317.
 use of, in the synthesis of tertiary cyclic alcohols (ZELINSKY), A., i, 660.
 new reactions of (MOUREU), A., i, 317.
 ferricyanides (FISCHER and MÜLLER), A., i, 455.
Magnesium, estimation of:—
 estimation of, by organic bases (HERZ and DRUCKER), A., ii, 348; (HERZ), A., ii, 478.
 estimation of, in presence of much iron oxide (PELLET), A., ii, 477.
 estimation of, in waters (WINKLER), A., ii, 347.
Magnetic field, behaviour of hæmoglobin compounds in a (GANGEE), A., i, 782.
 rotation. See Photochemistry.
 susceptibility, temperature coefficient of the, of some salt solutions of the iron group (MOSLER), A., ii, 643.
Magnetism and atomic weight (ERRERA), A., ii, 83.
Magnetite ores, estimation of iron in, by the specific gravity test (RICHARDS), A., ii, 132.
Maize and Maize-germ molasses. See Agricultural Chemistry.
Maize oil (*corn oil*), constitution of (VULTE and GIBSON), A., ii, 360.
 β -**Malamic acids**, *d*-, *l*-, and *i*-, and their salts, methyl ester and amides (LUTZ), A., i, 7.
Maleanil and Maleanilide and its hydrochloride (VAN DORP and VAN HAARST), A., i, 137.
Maleic acid, transformation of, into fumaric acid (SCHMIDT), A., i, 63.
Malephenylamic acid, action of phosphorus oxychloride on (VAN DORP and VAN HAARST), A., i, 137.
Malic acid, rotation dispersion of (WORINGER), A., ii, 214.
 action of formaldehyde on (ALBERDA VAN EKENSTEIN), A., i, 120.

- Malic acid**, acyl derivatives, ethyl esters, molecular rotation of (REITER), A., ii, 214.
 estimation of, in wine (HILGER), A., ii, 290.
- l-Malic acid**, salts, influence of molybdic acid and molybdates on the specific rotation of (ITZIG), A., i, 580.
- Malonic acid**, ethyl ester, action of bromine and carbon disulphide on the sodium derivative of (WENZEL), A., i, 402.
 action of ethyl citraconate, crotonate, and fumarate on (MICHAEL), A., i, 124.
 and ketones, action of sodium ethoxide on a mixture of (STOBBE), A., i, 549.
- Malonic acid**, bromo-, methyl ester, action of tertiary bases on (WEDEKIND), A., i, 504.
 nitro-, ethyl ester, and its sodium and potassium derivatives (WAHL), A., i, 445.
- Malonyl-mono- and -di-methylcarbamides**, imino-(4-imino-2:6-dioxy-1-mono- and -1:3-di-methylpyrimidines), and their isonitroso-derivatives (TRAUBE), A., i, 762.
- Malt**, a proteolytic and a rennet-like ferment in (WEIS), A., ii, 69.
 germs. See Agricultural Chemistry.
 kilns, estimation of arsenic in dust, tiles, &c., from (FAIRLEY), A., ii, 577.
- Maltase**, yeast, synthetic action of (EMMERLING), A., i, 258, 624 ; (HILL), A., i, 452.
 action of chemical agents on (BOKORNY), A., ii, 438, 568.
- Maltoglucose** secreted by *Monilia sitophila* (WENT), A., ii, 412.
- Maltol**, occurrence of, in the needles of *Abies alba* (FEUERSTEIN), A., ii, 526.
- Maltose**, isolation of, when mixed with glucose (HILL), P., 1901, 45.
 heat of fermentation of (BROWN), A., ii, 304.
 absorption of (REID), A., ii, 458.
- iso***Maltose** in blood, muscle, and urine (PANY and SIAU), A., ii, 257.
- Maltosuria** in a diabetic patient (LÉPINE and BOULUD), A., ii, 409.
- Man**, capacity of, to adapt himself to high and low temperatures (RUBNER), A., ii, 173,
 metabolism in (LOEWY and MÜLLER), A., ii, 609.
- Mandelic acid**, bimolecular anhydride of (EINHORN and PFEIFFER), A., i, 712.
- Mandragora roots**, alkaloids from (THOMS and WENTZEL), A., i, 405 ; (HESSE), A., i, 740.
- Mandragorine** (HESSE), A., i, 741.
- Manganese alloy** with aluminium (BRINCK), A., ii, 656.
- Manganese alums** (CHRISTENSEN), A., ii, 512.
- Manganese mercury double iodide**, hexahydrate of (DOBROSERDOFF), A., ii, 103.
 oxides (CHRISTENSEN), A., ii, 512.
 sulphate, temperature coefficient of susceptibility of solutions of (MOSLER), A., ii, 643.
- Permanganates**, the colour of solutions of (VAILLANT), A., ii, 596.
- Manganic meta- and pyro-phosphates** (AUGER), A., ii, 554.
- Manganous chloride**, compounds of, with cupric oxide (MAILHE), A., ii, 601.
 sulphate and its hydrates, solubility of (COTTRELL), A., ii, 12 ; (RICHARDS and FRAPPIÉ), A., ii, 553.
- Manganese**, detection, estimation and separation of:—
 detection and estimation of minute quantities of (MARSHALL), A., ii, 350.
 modification of Williams' method for estimating (BOLLING), A., ii, 626.
 estimation of, as phosphate (DAKIN), A., ii, 131.
 estimation of, in ferro-chromium alloys (T.), A., ii, 283.
 estimation of, in ferro-manganese (NORRIS), A., ii, 579.
 estimation of, in tungsten alloys (IBBOTSON and BREARLEY), A., ii, 198.
 separation of, electrolytically, from lead (MOLTKE-HANSEN), A., ii, 478.
- Manganese minerals** from Hautes-Pyrénées (LACROIX), A., ii, 395.
- Manganese ore deposits** of Queluz, Brazil (DERBY), A., ii, 558.
- Mangan-hedenbergite** from Ceylon (COOMARA-SWAMY), A., ii, 172.
- Manganocalcite** from Gross-Tresny, Moravia (KOVÁŘ), A., ii, 606.
- Mangolds**. See Agricultural Chemistry.
- Manna** of olive trees (TRABUT), A., ii, 184 ; (BATTANDIER), A., ii, 268.
- Mannitol**, relation between the solubility and heat of solution of (CAMPETTI), A., ii, 642.
 action of *Bacillus coli communis* on (HARDEN), T., 621 ; P., 1901, 58.
 an enzyme which produces (GAYON and DUBOURG), A., i, 784.

- Mannitol**, nitro-derivatives of, comparison of, with nitrocelluloses (VIGNON and GERIN), A., i, 662.
- d*-**Mannitol** triacetal and triformal, thermochemical data of (DELÉPINE), A., i, 4.
- Mannose** from *Lilium* bulbs (PARKIN), A., ii, 414.
- Manometer**, new (RAYLEIGH), A., ii, 542.
- Manures**, estimation of phosphoric acid in (V. LORENZ), A., ii, 278; (LEDOUX), A., ii, 576.
- See also Agricultural Chemistry.
- Margarine**, cryoscopic distinction between butter and (PESCHGES), A., ii, 680.
- detection of Ceylon oil in (INDEMANS), A., ii, 78.
- estimation of butter-fat in (REPORT OF JOINT COMMITTEE), A., ii, 77.
- Marl**, natural history of (DAVIS), A., ii, 516.
- Marmot**, respiration and temperature of the (PEMBREY), A., ii, 608.
- Marshite** from Broken Hill, New South Wales (SPENCER), A., ii, 394.
- "**Martellin**." See Agricultural Chemistry.
- Mass action**. See under Affinity.
- Maxwell's law**, $K=n^2$, in reference to the molecular structure of substances (BATSCHINSKI), A., ii, 595.
- Meat**, composition and nutritive value of different kinds of (BEYTHIEN), A., ii, 177.
- salted, red colour of (HALDANE), A., ii, 462.
- Meat extract** (JUNG), A., ii, 258.
- Medicines**, cryoscopic testing of (v. POEHL), A., ii, 211.
- Meerscham** from Bosnia (KIŠPATIO), A., ii, 321.
- Melamine** (*cyamurtriamide*), absorption spectra of (HARTLEY, DOBBIE, and LAUDER), T., 860; P., 1901, 125.
- Melaninic acid**, oxidation of (JONES and AUER), A., i, 554.
- Melanins**, nature of (DUCCESCHI), A., i, 354.
- Melanoidin**, physiological action of (ROSENFELD), A., ii, 180.
- Melite** (ZAMBONINI), A., ii, 397.
- Melittiose** (*melitose*). See Raffinose.
- Mellitic acid** (VERNEUIL), A., i, 546.
- Melonite** from Worturpa, South Australia (DIESELDORFF), A., ii, 393.
- Melting point**, relation between atomic weight, atomic volume and (BAYLEY), A., ii, 497.
- relation between expansion and, of metals (LEMERAY), A., ii, 145.
- Melting point** of alums (LOCKE), A., ii, 657.
- of aliphatic diamines, regularities in the (KAUFLER), A., i, 259.
- of reciprocal salt pairs (MEYERHOFFER), A., ii, 639.
- Melting point determinations**, improved apparatus for (STREATFEILD and DAVIES), A., ii, 302.
- Memorial lecture**: Rammelsberg (MIERS), T., 1; P., 1900, 219.
- Menthene**, active (KONDAKOFF and BACHTSCHÉEFF), A., i, 335.
- Δ^6 -**Menthene-2-one** and its mono- and di-oximes, oxaminoxime, oxalate, and semicarbazone, and its reduction products (HARRIES and STIRM), A., i, 551.
- Menthyl**, action of benzaldehyde on the sodium derivative of (MARTINE), A., i, 599.
- action of formaldehyde on (WEDEKIND), A., i, 393, 731.
- halogen derivatives of, and the hydrocarbons from them (KURSANOFF), A., i, 553.
- Menthols**, isomeric (KONDAKOFF and BACHTSCHÉEFF), A., i, 334.
- Menthone**, exhaustive bromination of (v. BAEYER and SEUFFERT), A., i, 216.
- Menthyl chlorocarbonate** (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 662.
- chloromethyl oxide (WEDEKIND), A., i, 393, 731.
- β -naphthyl methylene ether (WEDEKIND), A., i, 393.
- iodides, isomeric (KONDAKOFF and BACHTSCHÉEFF), A., i, 334.
- Mercaptan**, $C_{15}H_{14}ONS$, from benzylideneaniline and thioacetic acid (EIBNER), A., i, 321.
- Mercaptans**. See also:—
- Acetylphenyl- α -aminotrichloroethylhydrosulphide.
- Amyl mercaptan.
- 5-Benzylmercapto-2-phenylimino-3-phenyloxydiazoline.
- $\alpha\alpha$ -Diethylthiol- α -phenylethane.
- 1:4-Diphenyl-5-thio-1:2:4-triazolone-3-thiol.
- 1:4-Diphenyl-1:2:4-triazolone-3-thiol.
- 1:4-Diphenyl-1:2:4-triazolone-3-thio-methane.
- Ethyl mercaptan.
- 2-Mercapto-4:5-dimethylthiazoline.
- Methyl mercaptan.
- Methylmercaptotetrazol.
- Phenyldihydropyrimidyl mercaptan.
- Phenylmercaptotetrazole.
- 2-Phenyl-1-methylmercaptotriazole.

Mercaptans. See:—

4-Phenyl-1- α -naphthylthiotriazolone-thiol.

Phenylthiodiazoloneanilthiol.

Phenylthiodiazolonethiomethanes.

4-Phenyl-*p*-tolyl-5-thio-1:2:4-triazolone-3-thiols.

Tetraethylthiolbutane.

Tetrazelethiol.

p-Tolylthiodiazoloneanilthiol.

p-Tolylthiodiazolonethiomethane.

1:4:5-Triphenyldihydro-1:2:4-triazole-3-thiomethane.

m-Xylol mercaptan.

2-Mercapto-4:5-dimethylthiazoline

(STRAUSS), A., i, 18.

Mercaptoles from diketones (POSNER), A., i, 14; (TARBOURIECH), A., ii, 329.

from ketonic acids (POSNER), A., i, 703.

Mercerised cotton, action of aqueous ammonia on (THIELE), A., i, 634.**Mercury**, equilibrium between the different stages of oxidation of (ABEL), A., ii, 377.

solution of solid metals in (BERTHELOT), A., ii, 241.

direct introduction of, into aromatic compounds (DIMROTH), A., i, 439.

aluminium couple, use of, as a halogen carrier (COHEN and DAKIN), T., 1111; P., 1901, 91.

damage done to green plants by (DAFERT), A., ii, 269; (COUPIN), A., ii, 335.

alteration in the chemical properties of, when alloyed with magnesium (LE BON), A., ii, 20.

Mercury alloys (*amalgams*) with ammonium (COEHN), A., ii, 155.

with cadmium (ROOZEBOOM), A., ii, 507.

with calcium (SCHÜRGER), A., ii, 97.

with lead (FAY and NORTH), A., ii, 240.

with silver, heat of formation of (BERTHELOT), A., ii, 156.

with uranium (FÉRÉE), A., ii, 514.

Dimercuriammonium salts (RÂY), P., 1901, 96.

Mercury salts, comparison of the action of reducing agents on (BENNETT), A., ii, 131; (T. and C. T. TYRER), A., ii, 693.

iodoantimonide (GRANGER), A., ii, 386.

haloid salts solubility of, in organic solvents (ŠULC), A., ii, 101.

manganese double iodide, hexahydrate of (DOBROSERDOFF), A., ii, 103.

sulphide, action of hydrogen on (PÉLABON), A., ii, 545, 656.

Mercury:—

Mercuric salts, reduction of, by hydrogen peroxide (KOLB), A., ii, 160.

chloride and its double salts, toxic value of (CLARK), A., ii, 526.

compound of, with cupric oxide (MAILHE), A., ii, 601.

estimation of, in dressings (FREYRICH), A., ii, 204; (ÜTZ), A., ii, 348.

fluoride, behaviour of, in solution (JAEGER), A., ii, 386.

iodide, modifications of (DOBROSERDOFF), A., ii, 509.

types of double salts of, with iodides of metals of different valencies (DOBROSERDOFF), A., ii, 510.

formation of two kinds of mixed crystals of silver iodide and (ROOZEBOOM), A., ii, 20.

double salts of, with the iodides of cobalt and nickel (DOBROSERDOFF), A., ii, 510.

double salt of, with lithium iodide, nonahydrate of (DOBROSERDOFF), A., ii, 160.

double salts of, with potassium iodide (PAVLOFF), A., ii, 101.

oxide, action of, on aqueous solutions of metallic salts (MAILHE), A., ii, 452, 509; (RECOURA), A., ii, 508; (ANDRÉ), A., ii, 509.

Mercurous compounds, reduction of, by animal tissues (SOAVE), A., ii, 101.

chloride, alleged volatility of, at 37° (SOAVE), A., ii, 101.

nitrite (RÂY), A., ii, 452.

Mercury organic compounds (A. and L. LUMIÈRE and PERRIN), A., i, 356; (DIMROTH), A., i, 439.

Mercury salts, compounds of, with diethylarsine and tetraethyldi-
arsonium (BIGINELLI), A., i, 20.

Mercuric haloids, compounds of, with ethylene and allyl alcohol, constitution of (SAND), A., i, 458.

cyanide, solubility of, in organic solvents (ŠULC), A., ii, 101.

Mercuribenzoic acid, chloro- (MICHAELIS and RICHTER), A., i, 356.

o-**Mercuridibenzoic acid**, and its calcium salt (PESCI), A., i, 624.

o-**Mercuridiphenol** (DIMROTH), A., i, 439.

Mercurio- and Mercuri-diethylene oxide and the mercurichloride and picrate of the mercuri-compound (SAND), A., i, 682.

Mercury organic compounds:—

Mercuriguaiacolsulphonic acid, sodium salt (A. and L. LUMIÈRE and PERRIN), A., i, 356.

Mercuriphenoldisulphonic acid, sodium salt, as an antiseptic (A. and L. LUMIÈRE and CHEVROTIER), A., i, 244.

Substances, $C_6H_{10}O_2Hg_2$ and $C_8H_{10}O_2Hg$, from dipropylene oxide mercuric bromide (SAND), A., i, 682.

Mercury, estimation of:—

detection of, in urine (BARDACH), A., ii, 579.

estimation of, in officinal *hydrargyrum salicylicum* (RUPF), A., ii, 348.

estimation of, in ammoniated mercury and other mercury compounds (BENNETT), A., ii, 131; (T. and C. T. TYLER), A., ii, 693.

electrolytic separation of, from copper (SPARE and SMITH), A., ii, 692.

Mercury meniscus, value of the correction for the (WINKLER), A., ii, 574.

Merendera. See Agricultural Chemistry.

Mesaconic acid (*propylnedicarboxylic acid*), esters, action of diazomethane on (V. PECHMANN and BURKARD), A., i, 168.

menthyl ester (COHEN and WHITELEY), T., 1310; P., 1900, 213.

Mesitylene (1:3:5-*trimethylbenzene*), bromination and iodination of (EDINGER and GOLDBERG), A., i, 23.

nitroso- (BAMBERGER and RISING), A., i, 142.

Mesitylenic acid, α - and β -dinitro- and nitroamino- (BAMBERGER and DEMUTH), A., i, 209.

Mesitylhydroxylamine (BAMBERGER and RISING), A., i, 141.

Mesityl methyl ketone, oxidation of (VAN SCHERPENZEEL), A., i, 328.

Mesityl oxide (*methyl isobutenyl ketone*; *isopropylideneacetone*), action of chloroplatinic acid on (PRANDTL and HOFMANN), A., i, 13.

action of, on ethyl sodiomethylmalonate (CROSSLEY), T., 139; P., 1900, 90.

condensation of, with lemonal (DURAND, HUGUENIN & Co. and PHILIPPE BARBIER), A., i, 727.

sulphonal derivatives of (POSNER), A., i, 474.

Mesityl- ψ -quinol and its benzoyl derivative (BAMBERGER and RISING), A., i, 141, 142.

Mesoacridine, bromo- and iodo- (EDINGER), A., i, 166.

Mesolite from Golden, Colorado (PATTON), A., ii, 455.

Mesoporphyrin and its hydrochloride (NENCKI and ZALESKI), A., i, 434.

Mesotartaric acid, action of formaldehyde on (ALBERDA VAN EKENSTEIN), A., i, 120.

Mesothioacridone and its benzyl and benzoyl derivatives (EDINGER), A., i, 166.

Metabolism during training (LICHTENFELT), A., ii, 609.

influence of sugar as food on (V. BUNGE), A., ii, 458.

effect of the withholding of water on (SPIEGLER), A., ii, 458.

carbohydrate, in winter leaves (CZAPEK), A., ii, 571.

gaseous, of the submaxillary gland (BARCROFT), A., ii, 28, 609.

hepatic, influence of drugs on (NOËL PATON and EASON), A., ii, 253.

proteid, and alcohol (ROSEMAN), A., ii, 668.

and muscular work (BORNSTEIN; CASPARI), A., ii, 254.

in Cephalopods (V. FÜRTH), A., ii, 115.

in children, influence of boric acid and borax on (TUNNICLIFFE and ROSENHEIM; GRÜNBAUM), A., ii, 517.

influence of formaldehyde on (TUNNICLIFFE and ROSENHEIM), A., ii, 517.

in dogs with shortened small intestine (ERLANGER and HEWLETT), A., ii, 609.

before and after removal of the spleen (NOËL PATON), A., ii, 29.

and digestion in Echinoderms (COHNHEIM), A., ii, 668.

in horses (ZUNTZ), A., ii, 177.

in the pig during feeding with sugar, starch and molasses (MEISSEL and BERSCH), A., ii, 668.

in forced feeding (WHITE and SPRIGGS), A., ii, 28, 253.

in gout (WATSON), A., ii, 68.

in man (LOEWY and MÜLLER), A., ii, 609.

of creatinine (MACLEOD), A., ii, 115.

of hippuric acid (JOLLES), A., ii, 115;

(LEWIN), A., ii, 518.

of nuclein (LOEWY), A., ii, 325.

of proteid (LICHTENFELT), A., ii, 609.

Metal-ammonium compounds, nature of, in aqueous solution (DAWSON and MCCRAE), T., 493, 1069, 1072; P., 1901, 5, 177, 178.

Meta law, the (LAPWORTH), T., 1270; P., 1900, 103, 132; 1901, 2.

Metachlorophyllins. See under Chlorophyllin.

- Metallic chlorides**, action of hypochlorous acid on (v. TIESENHOLT), A., ii, 154; (FOERSTER), A., ii, 310.
 compounds of, with methyl sulphide (PHILLIPS), A., i, 444.
 compounds, reducing action of carbon on (BOUDOUARD), A., ii, 314.
 hydroxides, solubility of some, in ammonium and sodium salicylate (WOLFF), A., ii, 198.
 iodides, velocity of reaction and poly-molecular transformations between, and ferric salts, chromic acid, or nitrous acid (SCHÜKAREFF), A., ii, 647.
 oxide or hydroxide, action of, on solutions of salts of other metals (RECOURA), A., ii, 508; (SABATIER; ANDRÉ), A., ii, 509.
 oxides and salts, reduction of, by calcium carbide and silicon carbide (NEUMANN; v. KÜGELGEN), A., ii, 98.
 salts, slightly soluble, heat of formation of (KLEIN), A., ii, 225.
 specific absorption of X-rays by (BENOIST), A., ii, 215, 216, 308; (HÉBERT and REYNAUD), A., ii, 215.
 action of cupric hydroxide on solutions of (MAILHE), A., ii, 601.
 action of mercuric oxide on aqueous solutions of (MAILHE), A., ii, 452, 509; (RECOURA), A., ii, 508; (ANDRÉ), A., ii, 509.
 action of sodium thiosulphate on solutions of, at high temperature and pressure (NORTON), A., ii, 624.
 toxic action of, on plants (COUPIN), A., ii, 122, 335, 525; (DEHÉRAIN and DEMOUSSY), A., ii, 266; (DAFERT), A., ii, 269; (CLARK), A., ii, 526.
 compounds of, with aromatic amines (TOMBECK), A., i, 135, 164, 266.
 sulphates, action of cupric hydroxide on (RECOURA), A., ii, 508; (SABATIER; ANDRÉ), A., ii, 509.
 sulphides, thermoelectric behaviour of some (VAN AUBEL), A., ii, 222.
 precipitation of, with sodium thiosulphate (DONATH), A., ii, 424.
- Metalliferous deposits** of Canton Grisons (TARNUZZER, NUSSBERGER, and LORENZ), A., ii, 319.
- Metalloids**, action of potassammonium and sodammonium on (HUGOT), A., ii, 18.
- Metals**, arc spectra of some, as influenced by an atmosphere of hydrogen (CREW), A., ii, 81.
- Metals**, secondary radio-activity of (BECQUEREL), A., ii, 215; (CURIE and DEBIERNE), A., ii, 216.
 thermal and electrical conductivity, thermal capacity, and thermoelectric efficiency of some (JAEGER and DIESSELHORST), A., ii, 84.
 electro-affinity of the (DAWSON and MCCRAE), A., ii, 222.
 electrochemical relations between the allotropic modifications of (BERTHELOT), A., ii, 301.
 determination of the specific heat of, by their rate of cooling (SERDOBINSKY and EMELIANOFF), A., ii, 303.
 relation between expansion and melting point of (LÉMERAY), A., ii, 145.
 hardness of (BENEDICKS), A., ii, 374.
 solid, solution of, in mercury and fused metals (BERTHELOT), A., ii, 241.
 action of alcohols on (MALMÉJAC), A., i, 248.
 action of ammonia on, at high temperatures (BEILBY and HENDERSON), T., 1245; P., 1901, 190.
 chemical action between dry hauerite and (STRÜVER), A., ii, 317.
 action of, in transforming nitro-compounds into amino-derivatives (SABATIER and SENDERENS), A., i, 638.
 fixation of, by cell walls (DEVAUX), A., ii, 571.
 detection of, by the absorption spectra of their compounds with alkanna (FORMÁNEK), A., ii, 128.
 detection of minute quantities of, in natural waters (GARRIGOU), A., ii, 75.
 estimation of, by organic bases (HERZ), A., ii, 240, 478; (HERZ and DRUCKER), A., ii, 348.
 separation of, by means of acetylene (SÖDERBAUM), A., ii, 197.
- Metaphosphoric acid**. See under Phosphorus.
- Metasilicic acid**. See under Silicon.
- Meta-substitution** outside the nucleus (LAPWORTH), T., 1272; P., 1900, 108; 1901, 2.
 in benzenoid amines (LAPWORTH), P., 1901, 2.
- Metathioboric acid**. See under Boron.
- Metathoric acid**. See under Thorium.
- Meteoric iron** from Alt-Béla, Moravia (SMYČKA), A., ii, 607.
 from Kokstad, Bethanien, and Muchachos (COHEN), A., ii, 399.
 compact and granular (COHEN), A., ii, 251.

- Meteorite** from Ceylon (MEUNIER), A., ii, 322.
 from Lançon, France (MEUNIER), A., ii, 66.
 from Kesen (DAVISON), A., ii, 172.
 from Zomba, British Central Africa (FLETCHER), A., ii, 400.
- Methacetin** (*p*-acetylanisidine), colour reaction of, with potassium permanganate (MAAS), A., ii, 210.
- Methæmoglobin**. See under Hæmoglobin.
- Methanal**. See Paraformaldehyde under Formaldehyde.
- 1-Methanal-2-naphthylol**. See β -Hydroxy- α -naphthaldehyde.
- Methane**, production of, by the direct union of carbon and hydrogen (BONE and JERDAN), T., 1042; P., 1901, 162.
 decomposition of, at high temperatures (BONE and JERDAN); P., 1901, 165.
 absorption of, from the atmosphere by plants (URBAIN), A., ii, 273.
 oxidation of nitrogen as a source of error in the estimation of (WHITE), A., ii, 622.
- 3-Methenemethane** (GRIGNARD), A., i, 681.
- Methi-isomorphimethine** and its methiodide, and the action of heat on the methohydroxide (SCHRYVER and LEES), T., 577; P., 1901, 55.
- β -Methoxyacrylic acid**, α -cyano-, methyl and ethyl esters (DE BOLLEMONTE), A., i, 117.
- p*-Methoxyatrolactic acid** (BOUGAULT), A., i, 721.
- o*-Methoxyazobenzene** (BAMBERGER), A., i, 107.
- 1-Methoxybenzene**, 3-chloro-5-nitro- (DE KOCK), A., i, 460.
 chloronitrocyano- (VAN HETEREN), A., i, 460.
- m*-*o*-Methoxybenzoyl-3-ethoxyacetophenone** (V. KOSTANECKI and TAMBOR), A., i, 558.
- 2-Methoxybenzylacetophenone** and its *o*-nitrophenylhydrazine (FEUERSTEIN and MUSCULUS), A., i, 279.
- p*-Methoxybenzylidene-*p*-anisidine** (HANTZSCH and SCHWAB), A., i, 379.
- Methoxycarminonecarboxylic acid**, di-bromo-, methyl ester (LIEBERMANN and LANDAU), A., i, 545.
- Methoxycarminonedicarboxylic acid**, chloro- and bromo-, methyl esters (LIEBERMANN and LANDAU), A., i, 545.
- Methoxycarbonic acid** and anhydride (PERKIN and THORPE), T., 761.
- 7-Methoxycoumarone-4-carboxylic acid** and its methyl ester (V. PECHMANN and GRAEGER), A., i, 286.
- 7-Methoxy-2:3-dimethylchromone** (V. KOSTANECKI and LLOYD), A., i, 736.
- 3-Methoxy-2:6-dimethylphenetriol** and its triacetyl derivative (BOSSE), A., i, 207.
- 1-Methoxydiphenyl** (HÖNIGSCHMID), A., i, 700.
- Methoxyethoxybenzene**, 1:2- and 2:1-, 4-amino- and their acetyl derivatives, and 4-nitro- (WISINGER), A., i, 205.
- Methoxyethoxy-silicon dichloride** and *-isobutyl*oxy-silicon chloride (KIPPING and LLOYD), T., 458; P., 1901, 32.
- 6-Methoxy-2-ethylchromone** (V. KOSTANECKI, TAMBOR, and ORTH), A., i, 558.
- Methoxy-group**, orientating influence of the, on the nitro-group (KAUFLE and WENZEL), A., i, 590.
- 4-Methoxyhydrindene** (MOSCHNER), A., i, 374.
- Methoxymethylenecyanoacetic acid**. See β -Methoxyacrylic acid, α -cyano-.
- 13-Methoxy-10-methylphenanthrazine** (KAUFLE and WENZEL), A., i, 590.
- 9-Methoxy-10-methyl-7-phenylnaphthazonium salts** (FISCHER and BRUHN), A., i, 417.
- 2-Methoxy-4-methylpyrimidine**, 5-amino- (GABRIEL and COLMAN), A., i, 428.
- 9-Methoxy-10-methylrosindone** (FISCHER and BRUHN), A., i, 417.
- Methoxynaphthylidenecamphor** (HELBRONNER), A., i, 600.
- Methoxyphenacetin** (FREYSS), A., i, 321.
- m*-Methoxyphenoxyacetic acid** (GILBODY, PERKIN, and YATES), T., 1399; P., 1899, 27, 75, 241; 1900, 105.
- Methoxyphenylethenylcyclotriazan** (VOSWINCKEL), A., i, 53.
- Methoxyphenylglyoxylic acid**, *p*-amino- (BOEHRINGER & SONS), A., i, 714.
- Methoxyphenylhydrazonocyanoacetic acids**, *o*- and *p*-, and their esters and salts (LANX), A., i, 230.
- Methoxy-1-phenylmethylbenzoxazole** (HENRICH), A., i, 464.
- 2-Methoxy-5-isopropyl-1:4-benzoquinone**, 3:6-di-bromo- (HOFFMANN), A., i, 474.
- 2- γ -Methoxypropyldihydroisindole** and its aurichloride (FRÄNKEL), A., i, 45.
- p*-Methoxystyrene**, $\alpha\beta$ -dichloro- (KUNCKELL and ERAS), A., i, 75.
- 8-Methoxy-2:3:5-trimethylquinoxaline** (KAUFLE and WENZEL), A., i, 590.

- p*-Methoxytriphenylacetic acid and its methyl ester and bromo-derivative (BISTRZYCKI and NOWAKOWSKI), A., i, 716.
- Methyl acetyl- and benzoyl-iminodithiocarbonates (WHEELER and MERIAM), A., i, 514.
- Methyl alcohol, presence of, in the fermented juice of fruits (WOLFF), A., i, 110.
vapour pressure of, when mixed with aqueous salt solutions (WREWSKY), A., ii, 56.
molecular volume of, in organic solvents (CARRARA and LEVI), A., ii, 3.
esterification of, by nitrophthalic anhydride (MCKENZIE), T., 1140; P., 1901, 186.
influence of, as solvent, on the rotation of ethyl tartrate (PATTERSON), T., 173; P., 1900, 176.
absence of, in rum (WOLFF), A., i, 110; (QUANTIN), A., i, 111.
compound of, with methyl iodide (MEUNIER), A., i, 442.
detection of, in presence of ethyl alcohol (PRESCOTT), A., ii, 581.
detection of, in mixtures (MULLIKEN and SCUDDER), A., ii, 43.
detection of, in vinegar (ROBINE), A., ii, 353, 480.
- Methyl chloride, magnetic rotation of (SIERTSEMA), A., ii, 5.
- Methyl ether, preparation of (NEWTN), T., 917; P., 1901, 147.
and hydrogen chloride, mixtures of (KUNEN), A., ii, 146.
- Methyl ether, *mono*- and *s-di*-bromo- and -chloro-, and their compounds with pyridine and trimethylamine (LITTERSCHEID), A., i, 443.
- Methyl ethyl thiolcarbonate diphenyl-semicarbazone (WHEELER and DUSTIN), A., i, 26.
iodide, compound of, with methyl alcohol (MEUNIER), A., i, 442.
hydroperoxide and its barium salt (v. BAAYER and VILLIGER), A., i, 309.
mercaptan from albumin (NENCKI), A., i, 242.
sulphate (BLACKLER), A., i, 577.
sulphide, compounds of, with metallic chlorides (PHILLIPS), A., i, 444.
- Methyl-acetaldoxime and -isoacetaldoxime and the hydrolysis and reduction of the *iso*-compound (DUNSTAN and GOULDING), T., 635; P., 1901, 84.
- Methylacetone. See Methyl ethyl ketone.
- Methylacetonedicarboxylic acid, cyano-, ethyl ester (DERÔME), A., i, 313.
- Methyl-acetophenoxime and -isoacetophenoxime and the hydrolysis and reduction of the *iso*-compound (DUNSTAN and GOULDING), T., 637; P., 1901, 84.
- Methyl-acetoxime and -isoacetoxime and the hydrolysis and reduction of the *iso*-compound (DUNSTAN and GOULDING), T., 630; P., 1901, 84.
- Methylacetylacetone, action of, on diazo-chlorides (FAVREL), A., i, 167.
alcohol from (ZELINSKY and ZELIKOFF), A., i, 657.
- Methylacetylaminobenzoic acid, *o*-cyano-, methyl ester, conversion of, into indigo (ERDMANN), A., i, 536.
- Methylacetylcarbinol (VAN REYMENT), A., i, 126.
- Methylacetylmalononitrile (VAN REYMENT), A., i, 127.
- α -Methylacryl-benzylanilide, and -diphenylamide (BISCHOFF), A., i, 527.
- α -Methylacrylic acid, ethyl ester, action of ethyl oxalate on (LAPWORTH), T., 1282.
- α -Methylacryl-methyl- and -ethyl-anilides (BISCHOFF), A., i, 526.
- α -Methyladipic acid, preparation and dissociation constants of (MELLOR), T., 130; P., 1900, 215.
- β -Methyladipic acid, semialdehyde of (HARRIES and SCHAUWECKER), A., i, 448.
- Methyladipic acids and their anilides (BOUVEAULT and TETRY), A., i, 364.
- 4-Methylæsculetin (v. PECHMANN and v. KRAFFT), A., i, 286.
- Methylal, formation and decomposition of (DELÉPINE), A., i, 254, 314.
- as*-Methylallylethylene. See Hexinene.
- Methylamines and ammonia, estimation and separation of (QUANTIN), A., ii, 361.
- m*-Methylaminobenzenesulphonic acid and its isomeride, and their salts (GNEHM and SCHEUTZ), A., i, 519.
- o*-Methylaminobenzoic acid, ethyl ester (VORLÄNDER), A., i, 463.
cyano-, and its salts, esters, acetyl and nitro- and bromo-derivatives (KÖHNER), A., i, 537.
- Methyldiaminocresol, and its diacetyl derivative (PINNOW), A., i, 138.
- Methyl- α -aminoethylcarbinol (HENRY), A., i, 68.
- Methylaminocycloheptadiene and its salts, benzoyl and phenylthiocarbamide derivatives (WILLSTÄTTER), A., i, 650.
- m*-Methylaminophenol (GNEHM and SCHEUTZ), A., i, 520.

- 4-Methylaminophenyl- μ -cyanoazomethine-phenyl, -4-nitrophenyl and -carboxylic acid, ethyl ester (SACHS and BRY), A., i, 229.
- p*-Methylaminophenylglyoxylic acid and its phenylhydrazone (BOEHRINGER & SONS), A., i, 713, 714.
- Methylaminophenylthiodiazole and its hydrochloride and platinumchloride, and acetyl derivative (YOUNG and EYRE), T., 56; P., 1900, 188.
- Methyl-2:3:4-triaminotoluene, its diacetyl derivative and hydrochloride (PINNOW), A., i, 139.
- Methyl-2:4:5-triaminotoluene and its triacetyl derivative (PINNOW), A., i, 138.
- Methylanhalonidine and its salts (HEFFTER), A., i, 737.
- Methylanhydracetonebenzils, α - and β -, and α -Methylanhydracetonedibenzil and its potassium salt (JAPP and MELDRUM), T., 1028; P., 1901, 175.
- Methylaniline, action of acetylchloro-amino-2:4-dichlorobenzene on (CHATTAWAY and ORTON), T., 465; P., 1901, 39.
- chloroacetyl-, phenylsulphonacetyl, *p*-tolylsulphonacetyl, thiodiglycolyl, sulphonodiacetyl, cyanoacetyl, and thiocynoacetyl derivatives of (GROTHE), A., i, 79, 80.
- Methylaniline, *o*-chloro- (CHATTAWAY and ORTON), T., 465; P., 1901, 39.
- 3-chloro-6-nitro- (KEHRMANN and MÜLLER), A., i, 419.
- m*-nitro-, electrolytic reduction of (ROHDE), A., i, 136.
- Methylantranilic acid, ω -cyano-(phenylglycine-*o*-carboxylic acid, nitrile of) (FAREWICK MÜHLHEIM VORM. A. LEONHARDT & Co.), A., i, 709, 710.
- β -Methylantranol and its decomposition products (LIMPRICHT), A., i, 145.
- 4-Methyl-5:6-aziminopyrimidine (GABRIEL and COLMAN), A., i, 428.
- 1-Methylaziminotoluene, amino- and 7-nitro-, and 1-Methylaziminochlorotoluidine (PINNOW), A., i, 485.
- Methylbenzaconine, physiological action of, in relation to its constitution (CASH and DUNSTAN), A., ii, 612.
- Methylbenzo- β -ketopentamethylene-azinecarboxylic acid and its ethyl ester, and their benzylidene derivatives (THOMAS-MAMERT and STRIEBEL), A., i, 615.
- p*-Methylbenzoylbenzene-*o*-sulphonic acid and its salts (KRANNICH), A., i, 153.
- p*-Methyl-*o*-benzylbenzoic acid, and its salts, methyl ester, chloride, and amino- and trinitro-derivatives and their salts (LIMPRICHT), A., i, 145.
- p*-Methylbenzylidene-acetoacetic and -bisacetoacetic acids, ethyl esters (FLÜRSCHHEIM), A., i, 387.
- Methylbenzylideneaminophenylguanidine. See Acetophenoneaminophenylguanidine.
- Methylborneol (ZELINSKY), A., i, 661.
- γ -Methylbutane. See Pentane.
- Methylcyclobutane, ω -amino-, action of nitrous acid on (DEMJANOFF and LUSCHNIKOFF), A., i, 509.
- Methylbutane- $\alpha\beta\gamma\gamma$ -tetracarboxylic acids, ethyl esters, α - and β - (MICHAEL), A., i, 124.
- β -Methylbutane- $\alpha\gamma\gamma$ -tricarboxylic acid, ethyl ester (MICHAEL), A., i, 124.
- Methylbutane- $\alpha\beta\gamma$ -tricarboxylic acids, α - and β - (MICHAEL), A., i, 124.
- β -Methyl- β -butenoic acid (β -methylvinylacetic acid), γ -cyano- (GUARESCHI and PEANO), A., i, 631.
- Methyl isobutenyl ketone. See Mesityl oxide.
- β -Methyl- α -isobutyladipic acid (DIECKMANN), A., i, 541.
- Methyl*tert*.butylallylcarbinol, trihydroxy-compound, action of sulphuric acid on (PETCHNIKOFF), A., i, 183.
- Methylbutylallylcarbinols, *n*- and *sec*-, and their acetyl derivatives and trihydric alcohols (TALIEFF), A., i, 250.
- β -Methyl- β -butylene. See Amylene.
- $\beta\beta$ -Methylbutylglutaric acid (*octanedicarboxylic acid*) and its salts (GUARESCHI), A., i, 630.
- Methylbutylhydracrylic acids, and their salts (TALIEFF), A., i, 251.
- 4-Methyl-2-isobutylcyclopentanone and its oxime and semicarbazone (DIECKMANN), A., i, 541.
- α -Methylbutyric acid. See Valeric acid.
- Methylbutyrylacetic acid, methyl ester (BONGERT), A., i, 654.
- 2-Methylcamphenepyrroles, α -, β -, and γ -, and the 3-carboxylic acids of the α - and β -compounds (DUDEN and HEYNSIUS), A., i, 747.
- Methylcamphenepyrroline and its picrate and platinumchloride (DUDEN and HEYNSIUS), A., i, 748.
- Methylcamphoroxalic acid and its ethyl ester (TINGLE), A., i, 633.
- Methylcarbanilic acid, methyl ester (WHEELER and DUSTIN), A., i, 24.
- Methylcarbimide (*methyl isocyanate*), absorption spectra of (HARTLEY, DOBBIE, and LAUDER), T., 856; P., 1901, 125.

- Methylchloroindazole** (FISCHER and SEUFFERT), A., i, 411.
- 10-Methylchlorophenyl-naphthaphenazonium salts** (FISCHER and BRUHN), A., i, 416.
- α -Methylcinnamic acid**, methyl ester, and the reduction of its fatty esters (COHEN and WHITELEY), T., 1311.
- 4-Methylcoumarin** (V. PECHMANN and V. KRAFFT), A., i, 235.
- Methylcoumaranones**, 4-, 5-, and 6-, synthesis of, and their oximes and semicarbazonones (STOERMER and BARTSCH), A., i, 94.
- Methylcoumarophenazine** (MARCHLEWSKI and SOSNOWSKI), A., i, 415.
- Methylcrotonic acids**, isomeric. See *Pentenoic acids*.
- Methylcyanooaniline** (*phenylmethylcyanamide*) (SCHOLL and NORR), A., i, 376.
- 4-Methyldaphnetin**, 3-chloro-, and dimethyl ether and diacetyl and dibenzoyl derivatives (V. PECHMANN and HANKE), A., i, 210.
- 4-Methyldeoxyxanthine** and its salts (TAFEL and WEINSCHENK), A., i, 106.
- Methyl-diisomylcarbinol** (*dodecyl alcohol*) and its acetate (GRIGNARD), A., i, 250, 680.
- Methyldibenzoylmethane** (ABELL), T., 931; P., 1901, 128.
- 4-Methyl-1:4-diethyl-, -4-isopropyl-, and -4-butyl-trimethylenedicarbonimide**, 3:5-dicyano- (GUARESCHI), A., i, 343.
- 2-Methyldihydroisocindole** and its platinum-chloride (FRÄNKEL), A., i, 45.
- Methyldihydrouracils**, 4- and 5-, and bromo-, synthesis of (FISCHER and ROEDER), A., i, 295.
- Methyl γ -dihydroxybutyl ketone** and its phenylcarbamate (TRAUBE and LEHMANN), A., i, 502.
- Methyldihydroxydiethylamine**, picrolonate of (MATTHES), A., i, 260.
- Methyldimethylolacetic acid** (*dihydroxy-pivalic acid*) (KOCH and ZERNER), A., i, 633.
- 2-Methyl-3-*n*-diphenyl-1:2-oxypyrrro-1:4-diazole**. See 4:5-Oxy-1:3-diphenyl-4-methylsotriazole.
- Methyldiphenylcyclopentenone** and its phenylhydrazine and 1-Methyl-2:3-diphenylcyclopentane (JAPP and MELDRUM), T., 1032; P., 1901, 175.
- Methylene**, chemistry of (THOMAS), A., i, 357.
- dibenzozate** (DESCUDÉ), A., i, 504, 644.
- iodide**, cryoscopic experiments with (GARELLI and BASSANI), A., ii, 541.
- Methylene-*o*-aminobenzoic acid**, methyl ester (ERDMANN), A., i, 536, 591.
- Methylene-*di-o*-aminodibenzoic acid**, methyl esters (MEHNER), A., i, 470; (ERDMANN), A., i, 591.
- Methylenebis-hydrazobenzene** (RASSOW; RASSOW and LUMMERZHEIM), A., i, 777.
- Methylenebistetronic acid** and its salts (WOLFF and SCHIMPF), A., i, 284.
- Methylenebiuret** and its mercurides (SCHIFF), A., i, 457.
- Methylene-chlorohydrin**, action of, on aniline and *o*-toluidine (GRASSI-CRISTALDI and SCHIAVO-LENI), A., i, 55.
- Methylene-derivatives**, condensation of, with aromatic nitroso-compounds (SACHS and BEY), A., i, 229.
- Methylenedicytisine** (FREUND and FRIEDMANN), A., i, 289.
- mp*-Methylenedioxybenzylideneindanone** (FEUERSTEIN), A., i, 279.
- Methylenedioxybromostyrene** (FEUERSTEIN and HEIMANN), A., i, 465.
- 3:4'-Methylenedioxy-5-ethyl-2-stilbazole** and its salts (BACH), A., i, 610.
- α -Methyleneglutaric acid** and its hydrobromide (V. PECHMANN and RÖHM), A., i, 253.
- Methylenemalonamide** and its mercurides (SCHIFF), A., i, 457.
- Methylenementhone**, amino- (FARBWERKE VORM. MEISTER, LUCIUS, and BRÜNING), A., i, 692.
- Methylenetetramethylene bromide** (DEMJANOFF and LUSCHNIKOFF), A., i, 509.
- Methylethylacetoxime**, latent heat of vaporization and specific heat of (LUGININ), A., ii, 145.
- α -Methyl- β -ethylacraldehyde**, action of hydrazine hydrate on (DENNER), A., i, 255.
- Methylethylamine**, formation of (DUNSTAN and GOULDING), T., 639.
- Methylethylfulvene**. See β -Butylidene-cyclopentene.
- β -Methyl- β -ethylglutaric acid** (*hexanedicarboxylic acid*) and its salts (GUARESCHI), A., i, 630.
- β -Methyl- α -ethyl- and - γ -bromoethylglutaric acids** (V. PECHMANN), A., i, 64.
- 1-Methyl-4-ethylcyclohexane** (SABATIER and SENDERENS), A., i, 459.
- 1-Methyl-3-ethylcyclohexanol-3** (ZELINSKY), A., i, 661.
- α -Methyl- β -ethylhydracrylic acid**, synthesis of (ASTACHOFF and REFORMATSKY), A., i, 447.
- β -Methyl- α -ethylideneglutaranilic acid** (V. PECHMANN), A., i, 64.

- β -Methyl- α -ethylideneglutaric acid.** See Dicrotonic acid.
- 2-Methyl-5-ethyl- ψ -indophenazine** and its salts (MARCHEWSKI and RADCLIFFE), A., i, 416.
- 3-Methyl-2-ethyl-, -2-*n*- and -*iso*-propyl-, -2-*isobutyl*-, and -2-*isocamyl*-4-ketodihydroquinazolines** and their salts (GOTTHELF), A., i, 764.
- Methyl ethyl ketone** (*methylacetone*), and its bromo- and chloro-derivatives (VAN REYMEANT), A., i, 126.
- Methylethylketotetramethylenecarboxylic acids**, isomeric, and their carbazones (MICHAEL), A., i, 125.
- Methylethylketotetramethylenetricarboxylic acid**, ethyl ester, and its oxime, phenylhydrazone, and semicarbazone (MICHAEL), A., i, 125.
- 1-Methyl-2-ethylpiperidine** and its salts (LIPP), A., i, 162; (HEIDRICH), A., i, 561.
- 2-Methyl-5-ethylpiperidine.** See Coppellidine.
- 2-Methyl-5-ethylpyridine**, action of, on substituted aromatic aldehydes (CASTNER), A., i, 562; (BACH), A., i, 609.
- d*-Methylethylthetine** platinichloride, *d*-camphorsulphonate, and *d*-bromocamphorsulphonate (POPE and PEACHEY), P., 1900, 163.
- Methylfenchyl alcohol** (ZELINSKY), A., i, 661.
- Methylfurfuraldehyde** (*methylfurfural*), preparation of, and its ω -bromo- and ω -chloro-derivatives (FENTON and GOSTLING), T., 807; P., 1901, 119.
spectral reactions of (OSHIMA and TOLLENS), A., ii, 484.
- Methylfurfuraldehyde**, ω -bromo-, from the action of hydrogen bromide on carbohydrates (FENTON and GOSTLING), T., 361; P., 1901, 22.
- α -Methylglutaric acid** (*butanedicarboxylic acid*), preparation and dissociation constants of (MELLOR), T., 126; P., 1900, 215.
- Methylgranatone** and its reduction, and its pinacone and its salts (PICCINI and CORTESE), A., i, 740.
- β -Methylhepta- β -*e*-diene.** See Octinene.
- β -Methylheptene.** See Octylene.
- δ -Methyl- β -heptene- ζ -one- γ -dicarboxylic acid**, β -amino-, ethyl ester (RADE and BILLMANN), A., i, 164.
- Methylheptenone**, synthesis of (IPATIEFF), A., i, 256.
- Methyl heptyl ketone** and its semicarbazone (V. SODEN and HENLE), A., i, 396.
- Methylcyclohexadiene.** See Dihydrotoluene.
- Methylhexamethylene.** its nitrile, dibromide, and chloro- (MABERY and SIEPLEIN), A., i, 306.
- Methylcyclohexane** (SABATIER and SENDERENS), A., i, 459.
- 1-Methylcyclohexanol-1** (ZELINSKY), A., i, 661.
- β -Methylcyclohexanolacetic acid**, methyl and ethyl esters (WALLACH and SALKIND), A., i, 155.
- Methylcyclohexanol-butyric and -propionic acids**, ethyl esters (V. BRAUN), A., i, 157.
- β -Methylcyclohexanone**, oxidation of (BOUVEAULT and TETRY), A., i, 364.
- 1-Methyl-2-cyclohexanonecarboxylic acid**, and its ethyl ester and phenylhydrazone (DIECKMANN), A., i, 542.
- β -Methylcyclohexeneacetic acid** and its esters and amide (WALLACH and SALKIND), A., i, 156.
- Methylhexene- β - and - ϵ -ols** and their acetates (GRIGNARD), A., i, 679.
- β -Methyl- γ - δ -hexenoic acid.** See Heptenoic acid.
- β -Methylhexoic acid.** See Heptoic acid.
- α -Methyl- δ -hexolactone** (MOHR), A., i, 364.
- β -Methylhexolactone- γ -carboxylic acid**, δ -bromo-, and β -Methylhexenolactone (V. PECHMANN), A., i, 64.
- Methylhexylcarbinol.** See *sec*-Octyl alcohol.
- Methylhexylenediamine** and its phosphate and sulphate (HARRIES), A., i, 194.
- β -Methylhydrindene**, α -amino- and its hydrochlorides and their platinichlorides and benzoyl derivatives (KIPPING and CLARKE), P., 1901, 181.
- β -Methylhydrindone** and its oxime (KIPPING and CLARKE), P., 1901, 181.
- Methylhydroxyethylamine**, picronolate of (MATTHES), A., i, 259.
- 2-Methylindole**, 3-nitro- (ANGELI and ANGELICO), A., i, 46.
- 1-Methyl-2-iodoethylpiperidine** hydriodide (HEIDRICH), A., i, 561.
- Methylisoprene.** See Hexinene.
- 2-Methyl-4-ketodihydroquinazoline** (GOTTHELF), A., i, 764.
- Methylketotetramethylenecarboxylic acid** and its semicarbazone, and -tricarboxylic acid, ethyl ester (MICHAEL), A., i, 125.
- α -Methyl α evulolactone** (BÉHAL), A., i, 279.

- Methylmalonic acid** (*isosuccinic acid*; *ethandicarboxylic acid*), ethyl ester, action of ethyl citraconate, crotonate and fumarate on (MICHAEL), A., i, 124.
sodium derivative, action of, on mesityl oxide (CROSSLEY), T., 139; P., 1900, 90.
- Methylmalonic acid**, cyano-, ethyl ester (HALLER and BLANC), A., i, 261.
- β -Methylmaltoside** (FISCHER and ARMSTRONG), A., i, 671.
- Methylmercaptotetrazole** and its salts (FREUND and PARADIES), A., i, 770.
- Methylmezcaline** and its methiodide (HEFFTER), A., i, 737.
- Methylmorpholine**, preparation of (MARCKWALD and CHAIN), A., i, 742.
- 7-Methylnaphthaphenazonium** and its salts, 9-chloro-5-amino- (KEHRMANN and MÜLLER), A., i, 419.
- Methyl- α - β -naphthazine** (WOHL and AUE), A., i, 163.
- Methylnaphthiminazole**, Gallinek's (MELDOLA and STREATFEILD), P., 1900, 183.
- Methyl- α -naphthiminazoles**, α - and β -, and their salts (FISCHER, FEZER, and REINDL), A., i, 413.
- Methyl nonyl ketone**, reaction of, with benzaldehyde in alcoholic potassium hydroxide (CARETTE), A., i, 13, 127.
condensation of, with cinnamaldehyde (CARETTE), A., i, 367.
- 3-Methyloctanone-7-al** and its acetal (HARRIES and SCHAUWECKER), A., i, 730.
- 3-Methylisooxazole-5-carboxylic acid** (WOLFF and HEROLD), A., i, 504.
- Methylpentadienes**. See Hexinenes.
- β -Methylpentane**. See Hexane.
- Methylpentane- $\alpha\beta\gamma\gamma$ -tetracarboxylic acids**, ethyl esters, α - and β - (MICHAEL), A., i, 123.
- Methylcyclopentanolacetic acid**, methyl and ethyl esters (WALLACH and SPERANSKI), A., i, 156.
- Methyl-2-cyclopentanolcarboxylic acids**, 1- and 3-, and their salts and ethyl esters (DIECKMANN), A., i, 540.
- Methyl-2-cyclopentanonecarboxylic acids**, 3- and 4-, and their copper derivatives and hydrolysis (DIECKMANN), A., i, 540.
- 3-Methyl- Δ^1 -cyclopentanecarboxylic acid** (DIECKMANN), A., i, 541.
- 3-Methyl- ψ -phenanthroline** (*3-methyl-4-7-quinolizoline*) and its 2-carboxylic acid and their salts (WILLGERODT and JABLONSKI), A., i, 51.
- 9-Methylphenanthroline-7-carboxylic acid** (*9-methyl-4:10-quinolizoline-7-carboxylic acid*) (WILLGERODT and v. NEANDER), A., i, 51.
- Methylphloroglucinol methyl ethers** and their bromo-derivatives (HERZIG and THEUER), A., i, 205.
- α -Methylpimelic acid** (*hexanedicarboxylic acid*), dissociation constants of (MELLOR), T., 131; P., 1900, 215.
- 1-Methyl-2-pipecoline** and its salts (SCHOLTZ), A., i, 749.
- 1-Methyl-2-pipecolylalkine iodide hydriodide**. See 1-Methyl-2-iodoethyl-piperidine hydriodide.
- 1-Methylpiperidine**, compound of, with α -chlorohydrin, and base from (BIENENTHAL), A., i, 129.
- 12-Methylprasindone**, 10-chloro-, and its chloride (KEHRMANN and MÜLLER), A., i, 420.
- β -Methylpropane- $\alpha\beta\gamma\gamma$ -tetracarboxylic acid**, ethyl ester (MICHAEL), A., i, 124.
- Methylisopropylallylcarbinol** and its trihydroxy and acetyl derivatives (WAGNER), A., i, 183.
- Methylisopropylamine** and its salts (DUNSTAN and GOULDING), T., 640.
- o*-Methylisopropylbenzene** (*o-isopropyl-toluene*) and its sulphonic acids and their salts and amides (SPRINKMEYER), A., i, 519.
- 8-Methyl-5-propyl-1:4-benzopyrnone** (RUHEMANN), T., 921; P., 1901, 155.
- 1-Methyl-4-isopropylcyclohexane** (SABATIER and SENDERENS), A., i, 459.
- 5-Methyl-8-propyl- and 8-Methyl-5-propyl-1:4-benzopyrnone-2-carboxylic acids** (RUHEMANN), T., 920; P., 1901, 155.
- Methyl-*n*-propylcarbinyl chlorocarbonate and carbonate** (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 662.
- $\beta\beta$ -Methylpropylglutaric acid** (*heptanedicarboxylic acid*), and its zinc salt (GUARESCHI), A., i, 630.
- 1-Methyl-3-*n*- and -*iso*-propylcyclohexanols-1** (ZELINSKY), A., i, 661.
- 3-Methyl-1-isopropylcyclopentanone and 4-Methyl-1-isopropyl-2-cyclopentanone-carboxylic acid**, ethyl ester (DIECKMANN), A., i, 541.
- 2-Methyl-5-isopropylphenylacetic acid**, and its dinitro-derivative, and ethyl ester (WALLACH and SPERANSKI), A., i, 156.
- 2 (or 5)-Methyl-5 (or 2)-isopropylphenylacetylene and -chloroacetylene** (KUNCKELL and KORITZKY), A., i, 75.
- 3-Methyl-5-propylpyrazole-4-carboxylic acid** and its methyl ester (BONGERT), A., i, 409.

- 5-Methyl-3-propylpyrazole-4-carboxylic acid, methyl ester (BONGERT), A., i, 653.
- 4-Methyl-3-propyl-5-pyrazolone (BONGERT), A., i, 654.
- 2 (or 5)-Methyl-5 (or 2)-isopropylstyrene, α,β -dichloro- (KUNCKEL and KORITZKY), A., i, 75.
- Methylisopropyl-tetra- and -hexa-hydrobenzylaniline and -tetrahydrobenzyl-dimethylamine (FARBWERKE VORM. MEISTER, LUCIUS, and BRÜNING), A., i, 691.
- 7-Methylpurine and its salts, and 5-amino- and 2-thio-derivatives (GABRIEL and COLMAN), A., i, 428.
- 4-Methyl-purone and -isopurone (TAFEL), A., i, 238.
- 4-Methylpyrazole and its 5-carboxylic acid, and its esters (v. PECHMANN and BURKARD), A., i, 167.
- 5-Methyl-pyrazole- and -pyrazoline-4:5-dicarboxylic acids (v. PECHMANN and BURKARD), A., i, 168.
- 4-Methylpyrazoline-5-carboxylic acid, methyl ester (v. PECHMANN and BURKARD), A., i, 167.
- 3-Methyl-5-pyrazolone (BONGERT), A., i, 410.
- 3-Methylpyridine, compound of, with chloroanil (IMBERT), A., i, 651.
- Methylpyridines. See also Picolines.
- 1-Methylpyridone, thio- (GUTBIER), A., i, 96.
- 2-Methyl-4-pyridylquinoline (TSCHIERNE), A., i, 749.
- 4-Methylpyrimidine, its amino-, bromo-, chloro-, and nitro-derivatives and their salts (GABRIEL and COLMAN), A., i, 427.
- 5-Methylpyrimidine (?) and its carboxylic acid (SCHLENKER), A., i, 763.
- Methylquinine, isonitroso-, and its salts (v. MILLER and RÖHDE), A., i, 96.
- Methylquinoline, 5-nitro- (DECKER), A., i, 655.
- 1-Methylquinoline, diiodo- and its salts and diodonitro- (EDINGER and SCHUMACHER), A., i, 47.
- 2-Methylquinoline (*quinaldine*), action of phthalic chloride on (EIBNER and LANGE), A., i, 348.
- 1-Methylquinolinesulphonic acid and its barium salt (EDINGER and SCHUMACHER), A., i, 47.
- 1-Methylquinolone, thio- (GUTBIER), A., i, 96.
- 1-Methyl-2-quinolone, nitro-derivatives of (DECKER), A., i, 654.
- p*-Methyl- α - and - β -quinophthalines and *p*-Methylquinophthalone and its bromo- and nitro-derivatives, and anil (EIBNER and SIMON), A., i, 611.
- 6-Methylquinoxaline-2:3-diacetic acid, ethyl ester (THOMAS-MAMERT and STRIEBEL), A., i, 615.
- 7-Methylrosindone, 9-chloro- (KEHRMANN and MÜLLER), A., i, 420.
- 10-Methylrosindone, 9-chloro- (FISCHER and BRUHN), A., i, 417.
- Methylrosindone and its salts (FISCHER and CAMMERLOHER), A., i, 417.
- 10-Methylrosindone and its salts (FISCHER and BRUHN), A., i, 416.
- Methylsemicarbazide, v. Brüning's, action of benzaldehyde on (YOUNG and OATES), T., 665; P., 1901, 86.
- Methylsemithiocarbazide hydriodide (FREUND and PARADIES), A., i, 770.
- Methylsuberolacetic acid, ethyl ester (WALLACH and VAN BEECK-VOLLENHOVEN), A., i, 156.
- Methylsuccinic acid from pyruvic acid (WOLFF), A., i, 499.
- menthyl ester (COHEN and WHITELEY), T., 1310; P., 1900, 213.
- Methylsulphonetetrazole (FREUND and PARADIES), A., i, 770.
- β -Methyl- $\gamma\gamma\zeta$ -tetraethylsulphone-heptane (POSNER), A., i, 15.
- Methyltetrahydroquinoline. See Kairoline.
- Methyltetrahydroquinoliniumiodo-acetic acid, methyl ester (WEDEKIND), A., i, 640.
- Methylthioncarbanilic acid, methyl and ethyl esters, and their conversion to the thiol derivatives (WHEELER and DUSTIN), A., i, 21.
- Methylthio- ψ -uric and 3-Methylthiouric acids (BOEHRINGER & SONS), A., i, 770.
- Methyl-*p*-toluidine, β - and γ -dinitro-, and their acyl derivatives (PINNOW), A., i, 138.
- Methyltolylenediamine, nitro- (m. p. 127–128°) (PINNOW), A., i, 139.
- Methyltolylene-2:4-diamine and 5-nitro-, and their acetyl derivatives (PINNOW), A., i, 138.
- Methyltolylene-4:5-diamine, 3-nitro- (PINNOW), A., i, 485.
- Methyltricarbimide (*methyl isocyanurate*), absorption spectra of (HARTLEY, DOBBIE, and LAUDER), T., 859; P., 1901, 125.
- Methyltrimethylenecarbamide (TAFEL and WEINSCHENK), A., i, 71.
- 3:4-Methylecylotrimethylenecarbostyryl (DIECKMANN), A., i, 541.
- Methyl- $\alpha\beta$ -cyclotrimethylene-daphnetin and -umbelliferone (DIECKMANN), A., i, 541.
- N*-Methyltriphenoxazine-phenazonium nitrate and -carbazole and its salts (DIEPOLDER), A., i, 618.

- Δ^2 -Methyltropan** and dibromide, and their aurichlorides and the platinum-chloride of the dibromide (WILLSTÄTTER), A., i, 223, 649.
- Δ^3 -Methyltropan** hydrochloride, aurichloride and platinumchlorides, and dibromide (WILLSTÄTTER), A., i, 650.
- Δ^4 -Methyltropan** and its salts (WILLSTÄTTER), A., i, 225, 650.
- 4-Methylumbelliferone**, its 8-diazoanhydride, 8-diazosulphonic acid, and 8-amino- and 8-nitro-, and their acetyl derivatives and methyl ethers (V. PECHMANN and OBERMILLER), A., i, 336.
methyl ether, 6-amino- and 6-nitro- (V. PECHMANN and OBERMILLER), A., i, 337.
- 4-Methylumbelliferone**, 3-chloro-, and its acetyl and benzoyl derivatives (V. PECHMANN and HANKE), A., i, 210.
- Methyluracil**, electrolytic reduction of (TAFEL and WEINSCHENK), A., i, 71.
- 5-Methyluracil**. See Thymine.
- Methyluric acids**, reduction of, electrolytically (TAFEL), A., i, 237.
- γ -Methylvaleric acid**. See *iso*Hexoic acid.
- Methylvanillin**, chloro- and iodo- (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 727.
- 1-Methyl-2-vinylpiperidine** and its salts and reduction products (HEIDRICH), A., i, 561.
- 3-Methylxanthine** (BOEHRINGER & SONS), A., i, 770.
- 6-Methylxanthine** and its methylation (KRÜGER), A., i, 170.
- Mezcaline**, its constitution, benzoyl and dibromo-derivatives and salts (HEFFTER), A., i, 737.
- Mica** from Ceylon (COOMARA-SWAMY), A., ii, 171.
- Micelles**, albuminous, physical properties of (POSTERNAK), A., ii, 231, 544, 648.
- Microcline**, white, from the Ilmen Mountains (STOMA), A., ii, 397.
- Microelite** from Finland (NORDENSKIÖLD), A., ii, 515.
- Micro-organisms**, oligonitrophilous (BEYERINCK), A., ii, 523.
- Microperthite** from Wisconsin (WEIDMANN), A., ii, 170.
- Miersite** from Broken Hill, New South Wales (SPENCER), A., ii, 394.
- Migration**, successive, of groups (LAPWORTH), T., 1265; P., 1901, 2, 93.
- Milk**, human, composition of the ash of (CAMERER and SÖLDNER), A., ii, 173; (DE LANGE), A., ii, 174.
iron in (JOLLES and FRIEDJUNG), A., ii, 671.
- Milk**:—
Colostrum, human (LAJOUX), A., ii, 671.
- Milk**, acidity of (VIETH and SIEGFELD), A., ii, 46.
preservation of, for analysis (DUBOIS), A., ii, 429.
refractive power, amount of volatile fatty acids, and the iodine number of the fat of (HOLM, KRATZ, and PETERSEN), A., ii, 291.
agreement between the solids of, actually determined and those found by calculation (AMBUHL), A., ii, 137.
calculations used in the analyses of skimmed and diluted (LOUISE and RIQUIER), A., ii, 429.
analysis of sour (DUBOIS), A., ii, 429.
detection of boiled and unboiled (UTZ), A., ii, 423; (GLAGE), A., ii, 429.
detection of alcohol in (UHL and HENZOLD), A., ii, 425.
detection of aniline-orange in (LYTHGOE), A., ii, 139.
test for formaldehyde in (LUEBERT), A., ii, 703.
detection of formaldehyde and lactose in (RIEGLER), A., ii, 206.
detection and estimation of preservatives in (BLYTH), A., ii, 453.
improvement of the diphenylamine test for nitrates in (HEFELMANN), A., ii, 532.
detection of nitrites in (BETTINK), A., ii, 422.
estimation of fat in, by means of anhydrous sodium sulphate (LE COMTE), A., ii, 359.
estimation of formaldehyde in (LIVERSEEGE), A., ii, 483.
estimation of lactose in (RIEGLER), A., ii, 693.
estimation of lactose in, by polarisation and reduction (SCHEIBE), A., ii, 204.
estimation of lactose and sucrose in condensed (S. H. R. and C. N. RIBER), A., ii, 355.
estimation of nitrogen in (VIVIAN), A., ii, 363.
See also Agricultural Chemistry.
- Milk sugar**. See Lactose.
- Millon's reagent**, preparation and use of (NASSE), A., ii, 289.
action of, on naphthols and phenol (VAUBEL), A., i, 28.
- Mineralogy**, contributions to (CLARKE), A., ii, 63.
- Minerals** containing rare earths, discovery and occurrence of (NORDENSKIÖLD), A., ii, 319.

- Minerals**, preparation of, for analysis, and synthesis of, by double decomposition (MEYERHOFFER), A., ii, 640.
colours of (v. KRAATZ-KOSCHLAU and WÖHLER), A., ii, 166; (WEIN-SCHENK), A., ii, 167.
Canadian (HOFFMANN), A., ii, 250, 319.
from Casal Brunori, near Rome (ZAMBONINI), A., ii, 560.
of Ceylon (GRÜNLING), A., ii, 111.
of Moravia (KOVÁŘ), A., ii, 606.
of Roumania (PONI), A., ii, 25.
cupriferous, with calcareous gangue, estimation of lead in (GUEROUlt), A., ii, 130.
rock-forming, from the Tatra Mountains (GORAZDOWSKI), A., ii, 170.
simple method for the spectrographic analysis of (HARTLEY and RAMAGE), T., 61; P., 1900, 191.
- Minerals**, new. See also :—
Badenite.
Bavenite.
Brostenite.
Ceruleite.
Conchite.
Coolgardite.
Geolyte.
Hussakite.
Lassallite.
Ledouxite.
Liveingite.
Miersite.
Mohawkite.
Molybdophyllite.
Robellazite.
Stibio-domeykite.
Stoffertite.
Synchysite.
Termierite.
- Mineral veins**, enrichment of, by later metallic sulphides (WEED), A., ii, 108.
- Mineral waters**. See under Water.
- Mirabilite** from Kirkby Thore, Westmoreland (TRECHMANN), A., ii, 396.
transformation of, into thenardite (SCHEITSCHUSCHNY and KURNAKOFF), A., ii, 605.
- Mixtures**, binary, vaporisation of (v. ZAWIDZKI), A., ii, 6; (TAYLOR), A., ii, 7; (SCHREINEMAKERS), A., ii, 9, 57; (KOHNSTAMM), A., ii, 145; (CAUBET), A., ii, 147; (DUHEM), A., ii, 372; (KOHNSTAMM and VAN DALFSEN), A., ii, 641.
influence of foreign substances on the vapour pressure or boiling point of (SCHREINEMAKERS), A., ii, 445, 641.
- Mixtures**, ternary, vapour pressure of (SCHREINEMAKERS), A., ii, 9, 57, 146, 224, 305, 372, 436, 641.
- Mohawkite** from Michigan (KOENIG), A., ii, 108; (RICHARDS), A., ii, 515.
- Molasses**, analysis of (ANDRLÍK, URBAN, and STANĚK), A., ii, 287.
See also Agricultural Chemistry.
- Molasses residues**, acids soluble in ether in (HERZFELD), A., ii, 681.
- Molecular heat**. See Thermochemistry.
refraction. See Photochemistry.
structure of substances in reference to Maxwell's law $K=n^2$ (BATSCHINSKI), A., ii, 595.
weight. See Weight, molecular.
- Molecular-solution-volume** of ethyl tartrate (PATTERSON), T., 214, 482; P., 1900, 177; 1901, 41.
- Molybdate magnesia process**, Wagner's, conversion of, into a purely molybdate one (SEYDA), A., ii, 639.
- Molybdenum**, specific heat of (DEFACQZ and GUICHARD), A., ii, 659.
and its oxides, action of steam and of mixtures of steam and hydrogen on (GUICHARD), A., ii, 62.
- Molybdenum alloys**, production of, in the electric furnace (SARGENT), A., ii, 105.
with aluminium (GUILLET), A., ii, 512, 602.
- Molybdenum boride** (TUCKER and MOODY), P., 1901, 129.
pentachloride, action of water on (GUICHARD), A., ii, 243.
iodides, oxides, and sulphides (GUICHARD), A., ii, 62, 243, 659.
- Molybdic acids** (KLASON), A., ii, 162.
- Molybdo-sulphuric acid**, reduction of, by alcohol (PÉCHARD, A., ii, 243).
- Molybdenum semipentoxide** (KLASON), A., ii, 162; (NORDENSKJÖLD), A., ii, 454.
trioxide, separation of, from tungsten trioxide (RUEGENBERG and SMITH), A., ii, 75.
oxides. See also Molybdenum blue.
oxychloride, Blomstrand's (KLASON), A., ii, 162; (NORDENSKJÖLD), A., ii, 454.
- Molybdenyl chloride**, double salts, with caesium, potassium, and with rubidium chlorides (NORDENSKJÖLD), A., ii, 454.
ammonium chloride (KLASON), A., ii, 162.
hydroxide (KLASON), A., ii, 162.
- Molybdenum sulphate**, new crystallised (BAILHACHE), A., ii, 243.
- Molybdenum**, estimation of, electrolytically (KOLLOCK and SMITH), A., ii, 694.

Molybdenum blue, soluble and insoluble (KLASON), A., ii, 163.

See also Molybdenum oxides.

Molybdophyllite from Wermland, Sweden (FLINK), A., ii, 664.

Monazite sand, separation of cerite earths from (MEYER and MARCKWALD), A., ii, 21.

Monchiquite from Mount Girnar, India (EVANS), A., ii, 456.

Monilia sitophila, a mould from Java (WENT), A., ii, 676.

influence of nutrition on the secretion of enzymes by (WENT), A., ii, 411.

Moorland waters. See under Water.

Morphenol, preparation of (VONGERICHTEN), A., i, 742.

methyl ether (SCHRIVER and LEES), T., 578; P., 1901, 55.

Morphide, chloro-, action of water on (SCHRIVER and LEES), T., 579; P., 1901, 55.

Morphidine (VONGERICHTEN), A., i, 405.

Morphine and *isomorphine*, relationship between (SCHRIVER and LEES), T., 566; P., 1901, 55.

extraction of, with immiscible solvents (PÜCKNER), A., ii, 707.

detection and estimation of (WIRTHLE), A., ii, 362.

estimation of, volumetrically (REICHARD), A., ii, 487.

estimation of, by reduction with silver nitrate (REICHARD), A., ii, 140.

estimation of, in opium by means of ammoniacal silver chloride (REICHARD), A., ii, 707.

*iso***Morphine**, action of hydrobromic acid, of phosphorus tribromide and trichloride, and of sodium ethoxide and methyl iodide on; and its diacetyl derivative (SCHRIVER and LEES), T., 573; P., 1901, 55.

*β-iso***Morphine**, preparation and separation of, from *isomorphine*, and its methiodide (SCHRIVER and LEES), T., 569; P., 1901, 54.

Morpholine and its derivatives, preparation of (MARCKWALD and CHAIN), A., i, 380, 741.

preparation of, from ethylene by means of the mercury ethyl ether salt (SAND), A., i, 741.

Moulds destroying fats in fodder (KÖNIG, SPIECKERMANN, and BREMER), A., ii, 676.

See also *Monilia sitophila* and Yeasts.

Mucin, the coagulating properties of (CHARRIN and MOUSSU), A., ii, 404.

Mucobromic acid, action of primary amines on, and its esters (SIMONIS), A., i, 268.

Mucobromic acid, benzoylhydrazone, semicarbazone, and ethylenediamine of (BISTRZYCKI and HERBST), A., i, 386.

Mucochloric acid, action of primary amines on, and its esters (SIMONIS), A., i, 268.

Mucophenoxybromic acid, benzoylhydrazone, phenylhydrazone, and semicarbazone of (BISTRZYCKI and HERBST), A., i, 386.

Mucosalbumin (KRÜGER), A., i, 621.

Mucous membranes, external, impermeability of, to hydrogen sulphide (CHAUVEAU and TISSOT), A., ii, 611.

Mucus, action of, on the organism (CHARRIN and MOUSSU), A., ii, 180.

Mud from the salt mines of Ischl, Salzburg (WIENER), A., ii, 114.

of Kanger Lake in Livonia (GLASENAPP), A., ii, 37.

from the salt lakes of Roumania (BUJOR), A., ii, 114.

Müllerite (ZAMBONINI), A., ii, 397.

Muscle, glycolytic enzyme in (BRUNTON and RHODES), A., ii, 563.

does it contain mucin? (FRIED and GIES), A., ii, 255.

nature of the sugar in (PAVY and SIAT), A., ii, 257.

frog's, physico-chemical properties of (OKER-BLOM), A., ii, 326.

rigor in (STEVENS), A., ii, 519.

action of iodine and iodides on (STOCKMAN and CHARTERIS), A., ii, 255.

invertebrate, proteids of (v. FÜRTH), A., ii, 117.

smooth, effect of carbon dioxide and oxygen on (CLEGHORN and LLOYD), A., ii, 255.

unstriated, proteids of (VINCENT and LEWIS), A., ii, 255.

vertebrate, chemistry and heat rigor curves of (VINCENT and LEWIS), A., ii, 460.

Muscle plasma, action of serum-globulin on the coagulation of (SPIRO), A., ii, 670.

Muscovite from the Tatra Mountains (GORAZDOWSKI), A., ii, 170.

Muscular energy, source of (BORNSTEIN; CASPARI; FRENTZEL and REACH; HEINEMANN; ZUNTZ), A., ii, 254; (LICHTENFELT), A., ii, 609.

irritability, new form of (LOEB), A., ii, 519.

tissue, composition and heat value of, from different animals (KÖHLER), A., ii, 255.

differentiation between albumins, albumoses, peptones, and syntonins of (BILTÉRYST), A., ii, 632.

- Mycelia.** See Agricultural Chemistry.
- Myrcene**, constitution of (BARBIER), A., i, 477.
reduction of (SEMMLER), A., i, 732.
- Myrcenol** and its constitution, acetate, aldehyde, and semicarbazone (BARBIER), A., i, 477, 731.
- Myristic anhydride.** See Tetradeceic anhydride.
- Myrosin** (BOKORNY), A., i, 176.
- "Myriotone"** as unit in osmotic measurements (ERRERA), A., ii, 375.
- N.**
- Naphtha**, Grosny, composition of (KONOWALOFF and PLOTNIKOFF), A., i, 246.
shale, composition of (STUART), A., i, 109.
- 1:8-Naphthal-bromo- and -chloro-imide** (FRANCESCONI and RECCHI), A., i, 722.
- Naphthalene**, bromination and iodination of (EDINGER and GOLDBERG), A., i, 23.
action of methylene chloride and ethylidene chloride on, in presence of aluminium chloride (BODROUX), A., i, 374.
- Naphthalene**, 2-chloro-, nitro-derivatives of (SCHEID), A., i, 520.
1:5-chloronitro- (CHEMISCHE FABRIK GRIESHEIM-ELEKTRON), A., i, 687.
1:5-di- and 1:3:8-tri-nitro- (KALLE & Co.), A., i, 687.
- β -Naphthaleneazo-o-cresol** and its benzoyl derivative (McPHERSON and GORE), A., i, 572.
- β -Naphthaleneazodiacetylsuccinic acid**, and its diethyl ester (BÜLOW and SCHLESINGER), A., i, 98.
- α -Naphthaleneazophenol** and its benzoyl derivative (McPHERSON and GORE), A., i, 572.
- α -Naphthaleneazothymol** and its benzoyl derivative (McPHERSON and GORE), A., i, 572.
- Naphthalene-1:8-dicarboxylic acid** and anhydride, *hexachloro-* (FRANCESCONI and RECCHI), A., i, 721.
- Naphthalenesulphonic acids** and chlorides, 1:5- and 1:8-dinitro- (FARBWERKE VORM. MEISTER, LUCIUS, and BRÜNING), A., i, 687.
- Naphthalenethiolsulphonic acids**, α - and β -, diazoaryl esters (TRÖGER and EWERS), A., i, 172.
- Naphthalic acid.** See Naphthalene-1:8-dicarboxylic acid.
- $\alpha\beta$ -Naphthaphenazine**, derivatives of (LINDENBAUM), A., i, 423.
- $\alpha\beta$ -Naphthaphenazine**, 1:5-diamino-, and its diacetyl derivative (KEHRMANN and MISSLIN), A., i, 423.
- $\alpha\beta$ -Naphthaphenazine-7:12-oxide** (WOHL and AVE), A., i, 613.
- Naphthapicric acid**, m. p. 145°, constitution of (KEHRMANN and STEINER), A., i, 101.
- 1:4-Naphthaquinol-3-acetoacetic and -3-malonic acids**, 2-bromo-, ethyl esters (LIEBERMANN and LANSER), A., i, 467.
- β -Naphthaquinolone-1:3-dicarboxylic acid** and its silver salt (DOEBNER and GLASS), A., i, 630.
- 1:4-Naphthaquinol-2-tetramethyldiaminodiphenylmethane** and its hydrochloride (MÜHLAU and KEGEL), A., i, 56.
- 1:2-Naphthaquinone**, 4:7-diamino- (KEHRMANN and STEINER), A., i, 102.
4:8-diamino-, and its diacetyl derivative (KEHRMANN and MISSLIN), A., i, 423.
- 1:4-Naphthaquinone**, 2:7-diamino- (KEHRMANN and STEINER), A., i, 102.
2:8-diamino-, and its diacetyl derivative (KEHRMANN and MISSLIN), A., i, 423.
- α -Naphthaquinone-3-acetoacetic acid**, 2-bromo-, ethyl ester, the fluorescent substance from (LIEBERMANN and LANSER), A., i, 465.
2-chloro-, ethyl ester, the fluorescent compound from (BERTHEIM), A., i, 467.
- α -Naphthaquinone-3-diketohydrindene**, 2-bromo- (LIEBERMANN and LANSER), A., i, 467.
- 1:4-Naphthaquinoneimine**, 2:8-diamino-, and its hydrochloride (KEHRMANN and MISSLIN), A., i, 422.
- α -Naphthaquinone-3-m- and -p-phenylenediamines**, 2-bromo- (LINDENBAUM), A., i, 423.
- α -Naphthaquinonetetramethyldiaminodiphenylmethane**, phenylhydrazone of, and its salts and acetyl derivative (MÜHLAU and KEGEL), A., i, 56.
- 1:4:7:10-Naphthatetrazine-2:3:8:9-tetracetic acid**, ethyl ester and its analogues (THOMAS-MAMERT and STRIEBEL), A., i, 615.
- Naphthenes**, general method for the syntheses of (SABATIER and SENDERENS), A., i, 263.
- α -Naphtheurhodole.** See 5-Hydroxy- $\alpha\beta$ -naphthaphenazine.
- α -Naphthiminazole**, 1-acetyl and 1-benzoyl derivatives of (FISCHER, FEZER, and REINDL), A., i, 413.

- α -Naphthol**, 4-nitro-, and its methyl and ethyl ethers (CHEMISCHE FABRIK GRIESHEIM-ELEKTRON), A., i, 698.
- dinitro-derivatives of* (SCHMIDT), A., i, 81.
- 2:4:7-trinitro- (*naphthapieric acid*) (KEHRMANN and STEINER), A., i, 102.
- 2:4:8-trinitro-, derivatives of (KEHRMANN and MISSLIN), A., i, 422.
- β -Naphthol**, action of, on aldehydes (ROGOFF), A., i, 152; (HEWITT and TURNER), A., i, 207.
- condensation of, with aldehydes and amines (BETTI), A., i, 81, 611, 753.
- unstable isomerides of the azo-derivatives of (BETTI and LEONCINI), A., i, 55.
- and α -naphthylaminemonosulphonic acids, azo-dyes from (V. GEORGIEVICS), A., i, 239.
- behaviour of the azo-dyes from, with sheep's wool (V. GEORGIEVICS and SPRINGER), A., i, 239.
- β -Naphthol**, 1:7-diamino- (CASSELLA & Co.), A., i, 760.
- dinitro-derivatives of* (SCHMIDT), A., i, 81.
- Naphthols**, action of aldehydoaminic bases on (BETTI and SPERONI), A., i, 81, 778.
- action of Millon's reagent on (VAUBEL), A., i, 28.
- derivatives of, transformation of, into the corresponding amines (BADISCHE ANILIN- and SODA-FABRIK), A., i, 695.
- β -Naphtholazodiphenylhydrazone-cyanoacetic acid**, ethyl ester (LAX), A., i, 231.
- β -Naphthol- β -o-, -m- and -p-azophenylbenziminazoles** (MIKLASZEWSKI and V. NIEMENTOWSKI), A., i, 761.
- α -Naphthol-4-sulphonic acid**, 2-nitro-, and its salts (WITT and SCHNEIDER), A., i, 699.
- Naphthol-7-sulphonic acid**, amino- (BADISCHE ANILIN- and SODA-FABRIK), A., i, 696.
- 4-Naphthol-2-tetramethyldiaminodiphenylmethane**, 1-amino- (MÖHLAU and KEGEL), A., i, 56.
- β -Naphthoxyacetic acid** and its amino- and nitro-derivatives, esters, salts, chloride, amide, and anilide, and the acetyl compound of the amino-derivative (SPITZER), A., i, 715.
- 2-Naphthoxyacetic anhydride**, 1-amino-, and 4-nitro-1-amino-, and their salts (SPITZER), A., i, 715.
- Naphthoxymethylbenzoxazoles**, α - and β - (COHN), A., i, 752.
- 2- α - and - β -Naphthoxymethyl-5-ethoxybenziminazoles**, and their salts (COHN), A., i, 353.
- β -Naphthyl borate** (MICHAELIS and HILLRINGHAUS), A., i, 356.
- Naphthylallopphanic acids**, α - and β -, ethyl esters (PICKARD and CARTER), T., 845; P., 1901, 123.
- α -Naphthylamine**, interaction of, with phenylurethane (DIXON), T., 105; P., 1900, 208.
- bismuth salts (VANINO and HAUSER), A., i, 290.
- α -Naphthylamine**, 4-nitro-, and its alkyl derivatives (CHEMISCHE FABRIK GRIESHEIM-ELEKTRON), A., i, 695.
- β -Naphthylamine**, *dinitro-derivatives of* (SCHEID), A., i, 521.
- Naphthylamines**, α - and β -, acetylation of (SUDBOROUGH), T., 539; P., 1901, 45.
- additive compounds of, with trinitrobenzene and -toluene and their acetyl derivatives, with ethyl trinitrobenzoate, ethyl and methyl picrates, and with picramide (SUDBOROUGH), T., 525; P., 1901, 44.
- Naphthylamines**, α - and β -, β - and α -nitroso-, action of nitrous acid on (HARDEN and OKELL), P., 1900, 229.
- α -Naphthylaminesulphonic acids**, formation of (BADISCHE ANILIN- and SODA-FABRIK), A., i, 695.
- α -Naphthylaminemonosulphonic acids** and β -naphthol, azo-dyes from (V. GEORGIEVICS), A., i, 239.
- behaviour of the azo-dyes from, with sheep's wool (V. GEORGIEVICS and SPRINGER), A., i, 239.
- Naphthyl-4-aminourazoles**, α - and β - (BUSCH and GROHMANN), A., i, 616.
- Naphthylbiurets**, α - and β - (PICKARD and CARTER), T., 845; P., 1901, 123.
- Naphthylcarbazine acids** and chlorides, α - and β -, ethyl esters (BUSCH and GROHMANN), A., i, 616.
- α -Naphthyl-dimethylcarbinol** (GRIGNARD), A., i, 393, 680.
- α -Naphthyl-di- α -tetrahydronaphthylguanidine** (SCHALL), A., i, 766.
- Naphthylenediamines** from dihydroxynaphthalenes (BADISCHE ANILIN- and SODA-FABRIK), A., i, 695.
- Naphthylenedimercuric dichloride** (DIMROTH), A., i, 440.
- β -Naphthylethylamine**, combination of, with sodium tetrazoditolylsulphonate (SEYEWITZ and BLANC), A., i, 621.
- α -Naphthylgalactoside**, preparation of (RYAN and MILLS), T., 705; P. 1901, 90.

- α -Naphthylguanazole** and its hydrochloride (PELLIZZARI and RONCAGLIOLI), A., i, 774.
- β -Naphthylisoeptylene**, and $\alpha\beta$ - and $\beta\beta$ -Naphthylpropylenes and their picrates (GRIGNARD), A., i, 393.
- Naphthylhydroxyoxamides**, α - and β -, and their acetyl derivatives, reactions of (PICKARD and CARTER), T., 844; P., 1901, 123.
- α -Naphthylmercuric salts** (DIMROTH), A., i, 440.
- Naphthyl methyl ketone**, selenium derivative of (KUNCKELL and ZIMMERMANN), A., i, 215.
- Naphthyl methyl ketones**, action of magnesium organic compounds on (GRIGNARD), A., i, 393.
- 1- β -Naphthyl-5-methylpyrazole** and its 3:4-dicarboxylic acid and diethyl ester (BÜLOW and SCHLESINGER), A., i, 99.
- 9- β -Naphthyl-10-methyliserosinduline** and its salts (FISCHER and BRUHN), A., i, 417.
- Naphthylolnaphthylloxynaphthylmethane**. See 2:2':2''-Trihydroxy-1:1':1''-trinaphthylmethane, *eso*-anhydride of.
- β -Naphthylrosinduline chloride**, 10-chloro- (KEHRMANN and HIBY), A., i, 419.
- 1-Naphthyl-1:3:4-triazoles**, α - and β -, and their salts (PELLIZZARI and BRUZZO), A., i, 571.
- Naphthylurazoles**, α - and β - (BUSCH and GROHMANN), A., i, 616.
- Nasturtiums**. See Agricultural Chemistry.
- Nataloin** and its pentacetyl and pentabenzoyl derivatives, **Nataloin-red**, and **Nataloresinotannol** and its *p*-coumarate and tetrabenzoyl derivative (TSCHIRCH and KLAIVENESS), A., i, 399.
- Natron** from British Columbia (HOFFMANN), A., ii, 320.
- Natural waters**. See under Water.
- Nef's views** on the Conrad, Frankland, and Wurtz reactions, criticism of (MICHAEL), A., i, 457.
- Neodymium**, atomic weight of, and its oxides (BRAUNER), P., 1901, 66. spectrum of (BAUR and MARC), A., ii, 634.
- Neodymium chloride** (MATIGNON), A., ii, 602. nitride (MATIGNON), A., ii, 61.
- Neo-erbia**, isolation of (G. and E. URBAIN), A., ii, 160.
- Neon**, isolation of, from air (DEWAR), A., ii, 597. preparation and physical properties of (RAMSAY and TRAVERS), A., ii, 237.
- Neon**, spectrum of (LIVEING and DEWAR), A., ii, 213. refraction of (RAMSAY), A., ii, 141.
- Nepenthes**, digestion in the ascidia of (CLAUTRIAU), A., ii, 183.
- Nephrite**, boulder of, in a street pavement at Breslau (GÜRICH), A., ii, 321.
- Nerium odorum***, constituents of the root of (BOSE), P., 1901, 92.
- Neroli oil** (WALBAUM), A., i, 39, 733; (E. and H. ERDMANN), A., i, 601.
- Nerve-cells**, action of nicotine on (PARSONS), A., ii, 408. and nerve-endings, stimulation and paralysis of (LANGLEY), A., ii, 671.
- Nerve degeneration**, chemistry of (HALLIBURTON and MOTT), A., ii, 260; (MOTT and HALLIBURTON), A., ii, 463.
- Nerve-muscle preparations**, action of solutions of sodium chloride on (CUSHING), A., ii, 671.
- Nervous tissue**, proximate composition of (BARBIERI), A., ii, 613. physiological action of extracts of (HALLIBURTON), A., ii, 181.
- Neutral-red**, use of, in the bacteriological examination of water (MACKILL; SAVAGE), A., ii, 696.
- Nickel**, simultaneous deposition of iron and, from mixed solutions of their sulphates (KÜSTER), A., ii, 555. action of ammonia on, at high temperatures (BEILBY and HENDERSON), T., 1251; P., 1901, 190.
- Nickel alloy** with aluminium (BRUNCK), A., ii, 656.
- Nickel arsenate**, octahydrated and anhydrous (DUCRU), A., ii, 23. ammoniacal arsenates (DUCRU), A., ii, 23, 73, 243. bromide and chloride, compounds of, with cupric oxide (MAILHE), A., ii, 601. iodate and its hydrates, solubility of (MEUSSER), A., ii, 555. iodide, double salt of, with mercuric iodide (DOBROSERDOFF), A., ii, 510. nitride (BEILBY and HENDERSON), T., 1252; P., 1901, 190. sulphate, temperature coefficient of susceptibility of solutions of (MOSLER), A., ii, 643. ammonium sulphate, electrochemical behaviour of (PFANHAUSER), A., ii, 538.
- Nickel organic compounds**:— ammonia cyanide (BERNOULLI and GREYER), A., i, 584.
- Nickel, detection and separation of**:— detection of, in presence of cobalt (DONATH), A., ii, 124; (DITZ), A., ii, 694.

Nickel, detection and separation of:—
estimation of, in steel (NORRIS), A., ii, 530.

separation of, from cobalt (ROSENHEIM and HULDSCHINSKY), A., ii, 533.

separation of, electrolytically, from cobalt (BALACHOWSKY), A., ii, 533.

separation of, from copper (SÖDERBAUM), A., ii, 197.

separation of, from zinc (TREADWELL and KRAMERS), A., ii, 281.

Nicotine, **Nicotelline**, and **Nicotimine** and their salts (PICTET and ROTSCHY), A., i, 339.

Nicotine, action of, on nerve-cells (PARSONS), A., ii, 408.

action of, on nerve-cells and nerve endings (LANGLEY), A., ii, 671.

estimation of, in cigarsmoke (HABERMANN), A., ii, 680.

estimation of, in tobaccos or tobacco extracts (TÓTH), A., ii, 363, 708.

Nicotinic oxide, constitution of (AUERBACH and WOLFFENSTEIN), A., i, 613.

Nicotinic acid (*pyridine-3-carboxylic acid*), α -amino-, methylester, and amide (KIRPAL), A., i, 227.

*iso***Nicotinic acid** (*pyridine-4-carboxylic acid*), ethyl ester, condensation of, with ketones (TSCHERNE), A., i, 749.

Nicotinic and *iso***Nicotinic chlorides** (MEYER), A., i, 407.

Niobite, new treatment of (MOISSAN), A., ii, 556.

Niobium, fused, preparation and properties of (MOISSAN), A., ii, 556.

Nitration by means of nitrates in presence of water (KONOWALOFF), A., ii, 501.

direct, in the fatty series (BOUVEAULT and WAHL), A., i, 4, 5; (WAHL), A., i, 310, 445.

Nitric acid and *peroxide*. See under Nitrogen.

Nitrides, presence of, in crystalline rocks (GAUTIER), A., ii, 14, 171, 398.

Nitrification. See Agricultural Chemistry.

Nitriles, dielectric constants of (SCHLUNDT), A., ii, 299.

action of alkyl haloids, alkyl salts of the α -bromo-acids of the acetic series, and alkylcarbinides on, in presence of magnesium bromide or iodide or zinc bromide (BLAISE), A., i, 133.

an additive reaction of (EIBNER and SENF), A., i, 166.

*iso***Nitriles** and *cyclo***Nitriles** (SABANÉEFF and PROSIN), A., i, 695.

Nitriles. See also:—

Acetonitrile.

Nitriles. See:—

α -Acetylpropionitrile.

Benzonitrile.

Benzyl cyanide.

Brassonitrile.

Butyronitriles.

Camphanonitrile.

Coumarilonitrile.

Dihydrolauronolnitrile.

Dimethylacetylacetonitrile.

$\alpha\epsilon$ -Dimethylheptenonitrile.

$\alpha\alpha$ -Dimethylolpropionitrile.

d-Diphenyltetramethylenedinitrile.

Elaidonitrile.

Heptenonitrile.

α -Hydroxy- β -butenonitrile.

Methylacetylmalononitrile.

Methylantranilic acid, ω -cyano-.

Methylhexamethylene, nitrile of.

Phenylacetonitrile.

α -Phenylbromopiperonylcinnamonnitrile.

α -Phenylethoxycinnamonnitriles.

α -Phenyl-*o*-glucocoumaronitrile.

Phenylglycine-*o*-carboxylic acid, nitrile of.

α -Phenylhydroxycinnamonnitriles.

α -Phenyl-*p*-methoxycinnamonnitrile.

α -Phenyl-*p*-methylcinnamonnitrile.

Pinocamphenonitrile.

Propionylacetonitrile.

Sorbonitrile.

Succinonitrile.

Tetrahydrothiophentetracarboxylodinitrile.

o-Toluidinoacetnitrile.

α -*o*-Toluidinopropionitrile.

p-Triazobenzonitrile.

Undecenonitrile.

Urethanophenylacetonitrile.

Valeronitriles.

Nitrilopentachloro-osmates (WERNER and DINKLAGE), A., ii, 661.

Nitrilophenols (FIQUET), A., i, 469.

Nitrilosulphates (DIVERS and HAGA), T., 1093; P., 1901, 164.

Nitroamines, new class of (FRANCHIMONT and LUBLIN), A., i, 674.

Nitro-compounds, aliphatic, preparation of (KAUFLER and POMERANZ), A., i, 634.

Nitro-compounds, aromatic (VAN HETEREN; DE KOCK; DE BRUYN and BLANKSMA), A., i, 460.

electrolytic reduction of (ELBS), A., i, 74; (ROHDE), A., i, 135.

electrolytic reduction of, to amines (ELBS and SILBERMANN), A., i, 459; (CHILESOTTI), A., i, 587; (BOEHRINGER & SONS), A., i, 682.

reduction of, to amines by the aid of metals (SABATIER and SENDERENS), A., i, 638.

- Nitro-compounds**, aromatic, reduction of, with tin and hydrochloric acid, avoiding the formation of bases containing chlorine in the (PINNOW), A., i, 485.
 reduction and action of, in the organism (WALKO), A., ii, 669.
- Nitroferriyanides**, constitution of (MIOLATI), A., i, 131.
- Nitrogen** in peas (JOHANNSEN), A., ii, 35.
 produced by *Bacillus pyocyaneus* (PAKES and JOLLYMAN), T., 322; P., 1900, 189.
 occurrence of, in uranium minerals (KOHLSCHÜTTER), A., ii, 598.
 band spectrum of (BERNDR), A., ii, 367.
 band spectrum of, in oscillatory spark (HEMSALECH), A., ii, 433.
 atomic weight of (SCOTT), T., 147; P., 1900, 204.
 valency of (POPE and HARVEY), T., 828; P., 1901, 120.
 stereochemistry of (SIMON), A., i, 49.
 quadrivalent, derivatives of (PILOTY and SCHWERIN), A., i, 517, 583.
 quinquivalent, isomeric salts containing (KIPPING and HALL), T., 430; P., 1901, 37.
 combustion of (SALVADORI), A., ii, 94.
 analogies between carbon, oxygen and, in similar linking (ERLENMEYER), A., i, 61.
 influence of caffeine on the excretion of (RIBAULT), A., ii, 565.
 variation in the excretion of, during insufficient nutrition (JAVAL), A., ii, 565.
 excretion of, after extirpation of the liver (LANG), A., ii, 407.
- Nitrogen bromides and chlorides**, substituted (CHATTAWAY and ORTON), T., 274, 816; P., 1900, 231; 1901, 124; A., i, 227.
 from *o*-, *m*-, and *p*-nitroacetanilide (CHATTAWAY, ORTON, and EVANS), A., i, 23.
 action of, on amines and phenylhydrazine (CHATTAWAY and ORTON), T., 461; P., 1901, 38.
- Nitrogen chloride**, formation and estimation of (NOYES and LYON), A., ii, 601.
 ammonium iodides (RUFF), A., ii, 16.
monoxide (nitrous oxide), latent heat of evaporation of (CROMPTON), P., 1901, 62.
dioxide (nitric oxide), preparation of; lecture experiment (SENIER), P., 1900, 227.
- Nitrogen peroxide (tetroxide)**, liquid, as a solvent (FRANKLAND and FARMER), T., 1356; P., 1901, 201.
 action of, on benzilmonoximes (PONZIO), A., i, 154.
- Nitrogen acids** :—
- Nitric acid**, formation of, during combustions (BERTHELOT), A., ii, 17.
 preparation of solutions of, for analysis (MEADE), A., ii, 530.
 physical properties of solutions of (VELEY and MANLEY), A., ii, 447.
 action of, on alcohols (KONOWALOFF), A., i, 249.
 analysis of, by Du Pont's nitrometer (PITMAN), A., ii, 192.
 toxicological detection of (FLEURY), A., ii, 277.
 detection and estimation of, in combination with alkali metals (PERMAN), A., ii, 532.
 improvement of the diphenylamine test for, in milk and water (HEFELMANN), A., ii, 532.
 rapid estimation of, in soils (MONTANARI), A., ii, 688.
 detection and estimation of, in water, with brucine and glacial formic acid (CAZENEUVE and DÉFOURNEL), A., ii, 532.
 estimation of, in water (KOSTJAMIN), A., ii, 38; (HENRIET), A., ii, 422; (WINKLER), A., ii, 627.
- Nitrates**, action of Bacteria on (PAKES and JOLLYMAN), T., 322, 459; P., 1900, 189; 1901, 39.
 displacement of the nitric acid of, by formic acid (CAZENEUVE), A., ii, 379.
 See also Agricultural Chemistry.
- Nitrous acid**, velocity of reaction and polymolecular transformations between, and metallic iodides (SCHÜKAREFF), A., ii, 647.
 oxidation of (VORLÄNDER), A., i, 462.
 action of, on wool (LIDOFF), A., i, 243.
 reactions of (V. BAeyer and VILLIGER), A., i, 309.
 detection of, in milk (BETTINK), A., ii, 422.
 estimation of, alone or in presence of nitrates (PELLET), A., ii, 73.
 estimation of, and separation of, from nitrates (DE KONINCK), A., ii, 73.
 estimation of, in waters (WINKLER), A., ii, 627.
- Nitrites**, electrolytic reduction of, and estimation of, in presence of ammonia and hydroxylamine (SULER), A., ii, 637.

Nitrogen, detection and estimation of:—
estimation of, oxidation of nitrogen as
a source of error in the (WHITE),
A., ii, 622.

detection of, in arsenic (CHRISTO-
MANOS), A., ii, 59; (FITICA), A.,
ii, 59, 236, 313; (ARNOLD and MU-
RACH), A., ii, 236.

estimation of, in cheese and milk
(VIVIAN), A., ii, 363.

estimation of, in a diazoamino-com-
pound (MEHNER), A., i, 473.

apparatus for the estimation of, in
nitrates by the Schulze-Tiemann
method (STANĚK), A., ii, 474.

error in Fritsch's method for the
simultaneous estimation of carbon
and, in organic compounds (VAN
AKEN), A., ii, 691.

estimation of, in saltpetre (BÜTTCHER),
A., ii, 124; (v. WISSELL), A.,
ii, 125.

estimation of, in urine for clinical
purposes (JOLLES), A., ii, 688.

estimation of dissolved, in natural
waters (WINKLER), A., ii, 696.

of amino-acids, estimation of the, in
urine (KRÜGER and SCHMID), A.,
ii, 290.

organic, estimation of, by Kjeldahl and
Will and Varrentrap's methods
(VAN ENGELN), A., ii, 343.

estimation of the availability of, in
fertilisers (STREET), A., ii, 531.

proteid, estimation of, in vegetable
matter (FRAPS and BIZZELL), A.,
ii, 140.

See also Agricultural Chemistry.

Nitro-groups, orientating influence of
the methoxy-group on (KAUFLE and
WENZEL), A., i, 590.

estimation of, volumetrically (ALT-
MANN), A., ii, 475.

Nitrohydroxylaminic acid and its salts
(ANGELICO and FANARA), A., i, 707;
(ANGELI and ANGELICO), A., ii, 381.

action of, on piperidine (ANGELI), A.,
i, 57.

salts, reactions of, with aldehyde,
amines, and nitroso-derivatives (AN-
GELI and ANGELICO), A., i, 322.

Nitromicrobium, assimilation of carbon
dioxide by (STUTZER), A., ii, 267.

Nitrometer, Du Pont's (PITMAN), A.,
ii, 192; (LUNGE), A., ii, 278.

estimations with the (SHEPARD), A.,
ii, 474.

**Nitrosamines, oxidation of (VORLÄN-
DER), A., i, 462.**

Nitroso-compounds, aromatic, condens-
ation of, with methylene derivatives
(SACHS and BRY), A., i, 229.

isoNitroso compounds (HOLLEMAN), A.,
i, 3.

Nitroso-groups, estimation of, in organic
compounds (CLAUSER), A., ii, 422.

Nitroxyl, NOH, reactions of (ANGELI
and ANGELICO), A., i, 322.

Nodules. See Agricultural Chemistry.

Nonaldehyde from oil of lemons (BUR-
GESS), P., 1901, 171; (v. SODEN), A.,
i, 733.

n-Nonanedicarboxylic acid (WALKER
and LUMSDEN), T., 1191.

Non-electrolytes. See Electrochemistry.
Noninene ($\beta\zeta$ -dimethyl- $\delta\zeta$ -heptadiene) and
its dihydrobromide (GRIGNARD), A.,
i, 680.

Noninoic acid (hexylpropionic acid)
(MOUREU and DELANGE), A., i, 360.

Nonoic acid (pelargonic acid) from the
action of fused potash on dihydroxy-
stearic acid (LE SUEUR), T., 1314;
P., 1900, 91.

synthesis of (MOUREU and DELANGE),
A., i, 360.

n-Nonoic anhydride (KRAFFT and RO-
SINY), A., i, 113.

Nonyl alcohols. See:—

Diisobutylcarbinol.

Diethylisobutylcarbinol.

Dimethylhexylcarbinol.

Nonylenic acid (ae-dimethylheptenoic
acid) and its amide and nitrile (TIE-
MANN, LEMME, and KERSCHBAUM),
A., i, 19.

$\Delta^{2,4}$ -**Norcaradiene-7-carboxylic acid**
(ψ -phenylacetic acid) and its salts and
derivatives (BRAREN and BUCHNER),
A., i, 385.

Norcarandicarboxylic acid, cis-1:2-, and
its ethyl ester and anhydride (BRAREN
and BUCHNER), A., i, 85.

Nori from Japan (OSHIMA and TOLLENS),
A., ii, 468.

Nostoe punctiforme, vegetation of, in
presence of different carbohydrates
(BOUILLHAC), A., ii, 571.

Nucleic acids (BANG; KOSSEL), A.,
i, 299.

preparation and analysis of some
(LEVENE), A., i, 299, 623.

Nuclein, metabolism of (LOEWI), A.,
ii, 325.

yeast, uracil from (ASCOLI), A., i, 108.

Nucleins, the phosphorus of (ASCOLI),
A., i, 108.

Nucleohiston (BANG; KOSSEL), A.,
i, 57, 299.

Nucleo-proteids in tea leaves (ASO), A.,
ii, 679.

Nutrition in summer and winter in
moderate climates (RANKE), A., ii, 29.

Nux vomica, assay of (BIRD), A., ii, 140.

O.

- Oatmeal**, analyses of some pure (DYER), A., ii, 481.
- Oats**. See Agricultural Chemistry.
- Obesity** in relation to perspiration (SCHATTENFROH), A., ii, 174.
- Obituary notices** :—
 Edmund Atkinson, T., 872, 888.
 Sir John Conroy, T., 889.
 Thomas Flower Ellis, T., 872.
 Sir John Bennet Lawes, T., 873, 890.
 Stevenson Macadam, T., 897.
 Richard Reynolds, T., 873.
 Saville Shaw, T., 875.
- Oceanic salt deposits**, formation of (VAN'T HOFF and V. EULER-CHELPIN; VAN'T HOFF and WILSON), A., ii, 249; (VAN'T HOFF and MEYERHOFFER), A., ii, 396; (VAN'T HOFF, HINRICHSSEN, and WEIGERT), A., ii, 506.
 crystallisation of (VAN'T HOFF), A., ii, 558.
- Ocellatic acid** and its potassium salt (HESSE), A., i, 596.
- Ocimene** from *Ocimum Basilicum* (VAN ROMBURGH), A., i, 220.
- Octane**, $\alpha\theta$ -diamino-, synthesis of, from sebatic acid, and its dibenzoyl derivative and salts, and action of nitrous acid on (CURTIUS and STELLER), A., i, 70.
- Octanedicarboxylic acids**. See :—
 $\beta\beta$ -Ethylpropylglutaric acid.
 $\beta\beta$ -Methylbutylglutaric acid.
- Octinene** (β -methylhepta- β -dicene), ζ -chloro- (CHEMISCHE FABRIK GRIESHEIM-ELEKTRON), A., i, 731.
- α -**Octinoic acid** (*amylpropionic acid*), and its esters, chloride, *p*-anisidide, α -naphthylamide, and toluidides (MOUREU and DELANGE), A., i, 359.
 hydrogenation of (MOUREU and DELANGE), A., i, 360.
- β -**Octinyl alcohol** and its acetyl derivative (MOUREU and DESMOTS), A., i, 443.
- Octobenzoylraffinose** (STOLLE), A., i, 189.
- Octohydrodinaphthylene oxide** (HÖNIG-SCHMID), A., i, 700.
- Octoic acid**, synthesis of (MOUREU and DELANGE), A., i, 360.
- n -**Octoic anhydride** (KRAFFT and ROSINY), A., i, 113; (AUTENRIETH), A., i, 186.
- Octomethylene-carbamide**, and -dicarb-anilide (CURTIUS and STELLER), A., i, 70.
- Octomethylenediamine**. See Octane, $\alpha\theta$ -diamino-.
- n -**Octoylphenylhydrazine** (AUTENRIETH), A., i, 186.
- Octyl alcohol**, action of, on its sodium derivative (GUERBET), A., i, 307.
- Octyl alcohol** (*dimethylumylcarbinol*) (MASSON), A., i, 250.
- Octyl alcohol** (*dimethylisoamylcarbinol*) and its acetate (GRIGNARD), A., i, 680.
- sec.* **Octyl alcohol** (*methylhexylcarbinol*), influence of, as solvent, on the rotation of ethyl tartrate (PATTERSON), T., 480; P., 1901, 40.
- Octylene** (γ -ethyl- β -hexene) (MASSON), A., i, 250.
- Octylene** (β -methylheptene), $\zeta\zeta$ -dichloro- (CHEMISCHE FABRIK GRIESHEIM-ELEKTRON), A., i, 731.
- Edema-fluid**, composition of (BAYLAC), A., ii, 566.
- Esophagus**, rhythmic activity of the (STILES), A., ii, 519.
- Ohm's law**, apparatus to illustrate (MILLER and KENRICK), A., ii, 56.
- Oils**, heat of combustion of, in their analysis (SHERMAN and SNELL), A., ii, 430.
 phosphorised, estimation of phosphorus in (STICH), A., ii, 422; (FRÄNKEL), A., ii, 423.
 vegetable (SCHIMMEL & Co.), A., i, 394.
 surface tension and viscosity of some (JEANCARD and SATIE), A., i, 394.
 modification of Welmans' reaction for (GEUTHER), A., ii, 48.
 estimation of carvone in (WALTHER), A., ii, 49.
 estimation of methyl anthranilate in (HESSE and ZEITSCHER), A., ii, 209.
- mineral**. See Naphtha, Petroleum and Shale oil.
- comparison between the bromine and iodine absorption figures of (VULTÉ and LOGAN), A., ii, 430.
- absolute iodine absorption number of (TORTELLI and RUGGERI), A., ii, 47.
- the Maumené test for (MITCHELL), A., ii, 587.
- detection of sesamé oil in (TAMBON), A., ii, 360.
- estimation of sulphur in (JEAN), A., ii, 687.
- elimination and estimation of water in (DAVIS), A., ii, 629.
- Oils**. See also :—
 Akee, oil of.
Alpinia malaccensis, oil of.
Andropogon muricatus, oil of.
 Angostura bark, oil from.

Oils. See:—

Barosma betulina and *B. serratofolia*, oil of.
 Bay, oil of.
 Bearsword oil.
 Bergamot oil.
 Buchu leaves, oil of.
 Calamus oil.
 Camphor oil.
 Cascarilla oil.
 Cassia flowers, oil of.
 Castor oil.
Catha edulis, oil from.
 Cedar nut oil.
 Ceylon oil (*cocoa butter*).
 Citron, oil of.
 Cocoa butter (*cocoanut oil*).
 Copal, Kauri, oil from.
 Corn oil.
 Cotton seed oil.
 Elder tree bark, oil of.
 Eucalyptus oil.
 Fennel oil.
 Geranium, oil of.
 Jasmine blossom, oil of.
 Juniper, oil of.
 Lemon oil.
 Linaloes oil.
 Maize oil.
 Neroli oil.
Oleum cacao.
 Olive oil.
 Orange blossom, oil of.
 Orange peel, sweet, oil of.
Picea vulgaris, oil from.
Pinus Pinaster, oil from.
Pinus sylvestris, oil from.
 Roses, oil of.
 Rose wood, oil of.
 Rue, oil of.
 Sandalwood oil.
 Sesamé oil.
Stillingia sebifera seeds, oil of.
 Sunflower oil.
 Thyme, oil of.
 Vetiver, oil of.
 Wood oil.
 Ylang-ylang oil.
Olefines, production of (NEF), A., i, 626.
 from the action of zinc powder on saturated fatty acids (HÉBERT), A., i, 251.
 action of hypochlorous acid on (KRASUSKY), A., i, 246.
 See also Hydrocarbons.
Oleic chloride and amide (KRAFFT and TRITSCHLER), A., i, 116.
Oleins, estimation of unsaponifiable matters in commercial (NEFF), A., ii, 360.
Oleum cacao (WELMANS), A., ii, 207.

LXXX. ii.

Olfactory sensibility, methods for determining the limits of (BERTHELOT), A., ii, 406.
Olive oil, mixed glycerides in (HOLDE and STANGE), A., i, 577.
Olives. See Agricultural Chemistry.
Olivetoric acid (ZOFF), A., i, 88; (HESSE), A., i, 595.
Olivetorinic acid (ZOFF), A., i, 88.
Olive trees, the manna of (TRABUT), A., ii, 184; (BATTANDIER), A., ii, 268.
Ononin (v. HEMMELMAYR), A., i, 160.
Onospin and its hydrolysis (v. HEMMELMAYR), A., i, 160.
Opalescence, apparatus for the observation of (TSVET), A., ii, 298.
Opals from Tuscany (D'ACHIARDI), A., ii, 109.
Opianic acid benzoylhydrazone and *N*-phenyloxime (BISTRZYCKI and HERBST), A., i, 387.
Opianylidene-*p*-hydroxyaniline (BISTRZYCKI and HERBST), A., i, 387.
Opium, assay of (STEVENS), A., ii, 631.
 estimation of morphine in, by means of ammoniacal silver chloride (REICHARD), A., ii, 707.
Opium alkaloids, thermochemical researches on the (LEROY), A., ii, 6.
Optical constants of chromium (MICHELI), A., ii, 82.
Optically active compounds, production of, from inactive substances (COHEN and WHITELEY), T., 1305; P., 1900, 212; (KIPPING), P., 1900, 226.
Optically inactive base, resolution of an, by an active alkyl haloid (SCHOLTZ), A., i, 749.
Orange-II (SISLEY), A., i, 775.
Orange blossom, oil of (HESSE and ZEITSCHER), A., i, 733.
Orange-peel, sweet, oil of (STEPHAN), A., i, 160.
Orange residues in Calabria, nutritive value of (GABRIELLI), A., ii, 71.
Orbicularic acid (HESSE), A., i, 596.
Orchil and "**Orchil red**," detection of, in wine (BELLER), A., ii, 210.
Orchitic extracts, composition and action of (DIXON), A., ii, 259.
Orcinol, nitroso-, and its ethers, constitution of (HENRICH), A., i, 464.
Ores, reduction of, by calcium carbide and silicon carbide (NEUMANN), A., ii, 98.
 containing sulphur, estimation of silver in (HOLLARD), A., ii, 578.
 estimation of sulphur in (PELLET), A., ii, 622.
Organic compounds, electro-synthesis of (ELBS and FOERSTER), A., i, 109.

- Organic compounds**, electro-capillary properties of, in aqueous solution (GOUY), A., ii, 83, 435.
 form of change in (LAPWORTH), T., 1265; P., 1901, 93.
 melted, change of temperature attending the solidification of (PAWLEWSKI), A., ii, 85.
 containing nitrogen, oxidation of (VORLÄNDER), A., i, 454.
 pyrogenic reactions of (IPATIEFF), A., i, 248.
 estimation of the nitroso-groups in (CLAUSER), A., ii, 422.
- Organic substances**, use of chromyl dichloride for the destruction of, in toxicological analysis (PAGEL), A., ii, 39.
 method for the destruction of, applicable to the detection of inorganic poisons (DENIGES), A., ii, 690.
 error in Fritsch's method for the simultaneous estimation of carbon and nitrogen in (VAN AKEN), A., ii, 691.
 oxidisable, estimation of, in water (RUPPIN), A., ii, 201.
- Organism**, relationship between physiological action, constitution and chemical change in the (HILDEBRANDT), A., ii, 614.
 synthesis in the (HILDEBRANDT), A., ii, 180, 669.
 formation of allantoin in the, from uric acid (SWAIN), A., ii, 610.
 localisation and dissemination of antimony in the (POUCHET), A., ii, 673.
 origin of iodine in the (BOURCET), A., ii, 520.
 origin of kynurenic acid in the (GLAESSNER and LANGSTEIN), A., ii, 669.
 formation of lactic acid in the (SAITO and KATSUYAMA), A., ii, 405.
 formation of oxalic acid in the (STRADOMSKY), A., ii, 404; (CIPOLLINA), A., ii, 668.
 formation of urea in the (V. GULEWITSCH), A., ii, 29.
 composition of fat in the (HENRIQUES and HANSEN), A., ii, 405.
 decomposition of atropine and cocaine in the (WIECHOWSKI), A., ii, 615.
 reduction and action of aromatic nitro-compounds in the (WALKO), A., ii, 669.
 type of reaction by which sodium carbonate and hydrochloric acid may be formed in the (OSBORNE), A., ii, 402.
- Organometallic compounds**, new reactions of (BLAISE), A., i, 133, 252, 363.
 action of, on alkyl esters (BÉHAL), A., i, 246; (MASSON), A., i, 249; (GRIGNARD), A., i, 250.
- Organometallic compounds**. See also:—
 Acetylacetone, platinum compounds.
 Anisylmercuric iodides.
 Benzeneazohydroxymethylphenylmercuric salts.
 Cacodylic acid.
 o-Carboxyphenylmercuric hydroxide.
 Cinnamylcacodylic acid.
 Diethylarsine.
 Diethylenediaminecobalt salts.
 p-Dimethylaminophenylmercuric salts.
 Dipropylene oxide mercuric bromide.
 Dipropylene oxide mercuric iodide.
 Ethanolmercuric iodide.
 Ethyl ether mercuric iodide.
 Ferrisalicyclic acid.
 Glycerarsenic acid.
 Hydroxymercuribenzoic acid.
 4-Hydroxy-1-methylphenylmercuric salts.
 Hydroxyphenylmercuric salts.
 Indiumacetylacetone.
 Mercuribenzoic acid.
 o-Mercuridibenzoic acid.
 Mercuridiethylene oxide.
 o-Mercuridiphenol.
 Mercuriguaiacolsulphonic acid.
 Mercuriphenoldisulphonic acid.
 Mercuriodiethylene oxide.
 Naphthylenedimercuric dichloride.
 α-Naphthylmercuric salts.
 Osmyloxalic acid.
 Phenetylmercuric salts.
 Phenylmercuric salts.
 Propylene glycol mercuric iodide.
 Pyridinium pentachlorochromate.
 o-Sulphomercuribenzoic acid.
 Tetraethyldiarsonium salts.
 Tetraethyldiacodylic acid.
 Urano-oxalic acid.
 Zinc ethyl.
 Zinc indigo-white.
- Organs**, transformation and regeneration of (LOEB), A., ii, 177.
 arsenic in the (HÖDLMOSE), A., ii, 673.
 ferment acting on salol in (NOBECOURT and MERKLIN), A., ii, 324.
 proteolytic enzymes in (HEDIN and ROWLAND), A., ii, 462.
 glycogen in (MEILLERE and LEPER), A., ii, 326.
- Orienteing influence** of the methoxy-group in the nitro-group (KAUFLEER and WENZEL), A., i, 590.

- Oroxylin**, isolation of, and its triacetyl and dibromo-derivatives, and decomposition products (NAYLOR and DYER), T., 954; P., 1901, 148.
- Orpiment** from Gross-Tresny, Moravia (KOVÁŘ), A., ii, 606.
- Orsat's apparatus**, improvement in (BEMENT), A., ii, 342.
- Orthocase** from the Tatra Mountains (GORAZDOWSKI), A., ii, 170.
- Orthoformic acid**. See under Formic acid.
- Orygmænic acid** and its salts from lichens (ZOFF), A., i, 547.
- Osmiamic acid**, constitution of (WERNER and DINKLAGE), A., ii, 661.
- Osmium**, nitroso-compounds, reduction of, and double salts (BRIZARD), A., ii, 108.
- Osmium**, estimation and separation of, in platinum ores (LEIDIÉ), A., ii, 62; (LEIDIÉ and QUENNESSEN), A., ii, 695.
- "Osmophoric" groups** (RUPE and v. MAJEWSKI), A., i, 103.
- Osmosis and Osmotic pressure**. See Diffusion.
- Osmylalacetic acid**, salts (WINTREBERT), A., i, 313.
- Osseo-mucoid** (HAWK and GIES), A., i, 298; ii, 520.
- Osyritrin** from *Osyris compressa* (PERKIN), P., 1901, 88.
- Ovalbumin**, characteristics of (GUÉRIN), A., ii, 211.
- Oxalacetic acid**, formation of, from tartaric acid (WOHLAND and OESTERLIN), A., i, 365.
- action of ammonia, aniline, hydrazine, hydroxylamine, phenylhydrazine, benzylphenylhydrazine, and urea on, and its oxidation (FENTON and JONES), T., 91; P. 1900, 205.
- phenylhydrazone, hydrazone, and hydrazine salt of the hydrazone (FENTON and JONES), T., 91; P., 1900, 205.
- Oxalacetic acid**, cyano-, ethyl ester, synthesis of (BERTINI), A., i, 776.
- Oxaldiacetic acid**. See Citic acid.
- Oxalic acid**, formation of, in the organism (STRADOMSKY), A., ii, 404; (CIPOLLINA), A., ii, 668.
- estimation of tartaric acid in presence of (PALLADINI), A., ii, 135.
- Oxalic acid**, double salts, and their crystallography (WYROUBOFF), A., i, 7.
- ammonium salt, formation of carbon during the electrolysis of (VERWER), A., ii, 693.
- decomposition of (GILLOT), A., i, 118.
- Oxalic acid**, calcium salt, occlusion of magnesium oxalate by, and solubility of (RICHARDS, McCaffrey, and BISBEE), A., ii, 624.
- detection of, in commercial hydrogen peroxide (ARTH), A., ii, 622.
- chromium salt (WYROUBOFF), A., i, 579.
- titanium salts (ROSENHEIM and SCHÜTTE), A., ii, 245.
- uranium derivative (KOHLSCHÜTTER and ROSSI), A., i, 448.
- Oxalic acid**, ethyl ester, action of phenol on (TINGLE and O'BYRNE), A., i, 533.
- condensation of, with *o*- and *p*-nitrotoluenes and with ethyl crotonate and α -methylacrylate (LAPWORTH), T., 1272; P., 1900, 109, 132.
- Oxalic diethyl ether**, *semi*-imino-, preparation of (LANDER), T., 702; P., 1901, 61.
- γ -Oxalocrotonic acid**, and its ethyl ester (LAPWORTH), T., 1276; P., 1900, 132; 1901, 96.
- Oxalyl diethyl acetoacetic acid**, ethyl ester (CONRAD), A., i, 66.
- Oxalyl dimethyl acetoacetic acid**, and its methyl ester and its salts; its oxime, and bromo- and thiazyl derivatives (CONRAD), A., i, 65.
- Oxanil** and *dithio*- (SABANÉEFF and PROSIN), A., i, 695.
- Oxanilic acid**, ethyl ester, and **Oxanilide**, alkylation of (LANDER), T., 699; P., 1901, 59.
- Oxazine derivatives**, synthesis of (BETTI), A., i, 611.
- syntheses of, by means of acetylaminonaphthalic acid (KEHRMANN and BARCHE), A., i, 47.
- Oxazole**, $C_9H_{13}O_3N$, from ethyl $\beta\beta$ -diacetylpropionate, hydroxylamine hydrochloride, and potassium carbonate (MARCH), A., i, 312.
- 5-isoOxazolone-3-*p*-nitrobenzeneazoacetic acid**, ethyl ester (BÜLOW and HÜFFNER), A., i, 241.
- Oxidation** by gaseous oxygen, mechanism of the reaction of (MANCHOT and HERZOG), A., ii, 549.
- by means of persulphates (NAMIAS), A., ii, 16.
- Autoxidation** (HABER), A., ii, 93.
- and its connection with the theories of ions and of the galvanic cell (HABER), A., ii, 299.
- Oxides**, thermoelectric behaviour of some (VAN AUBEL), A., ii, 222.
- action of zinc ethyl on (GRANICHSTÄDTEN and WERNER), A., i, 518.

Oxime, $C_6H_{11}O_2N$, from the action of nitric acid on dimethylethylcarbinol (KONOWALOFF), A., i, 249.

$C_6H_{13}O_3N$, from the aldol from the condensation of α -hydroxyisobutaldehyde with acetaldehyde (ROESLER), A., i, 669.

$C_7H_{13}ON$, and its acetyl derivative, from heptenoaldehyde (KOHN), A., i, 255.

$C_7H_{15}O_2N$, from the aldol, $C_7H_{14}O_2$ (WOGGINZ), A., i, 254; (KOHN), A., i, 255.

$C_8H_{15}O_2N$, from the aldol, $C_8H_{14}O_2$ (PLATTENSTEINER), A., i, 255.

$C_{10}H_{13}O_{12}N$, from the aldol, $C_{10}H_{12}O_2$ (HACKHOFFER), A., i, 278.

$C_{11}H_{15}O_3N$, from the aldol from isobutaldehyde and salicylaldehyde (HERZOG and KRUU), A., i, 213.

Oximes and their reduction to the corresponding amines (KONOWALOFF), A., i, 281.

model of the nitrogen atom showing the stereoisomerism of the (WEDEKIND), A., ii, 596.

Oximes. See also :—

Acetaldoximes.

4-Acetoacetylpyridine, oxime of.

Acetonylpropylidenebistetric acid, oxime of.

Acetophenoneoximes.

Acetoxime.

Acetylaminohydroxyacetophenone-oxime.

Acetylbenzoyl-*p*-bromophenylhydraz-oxime.

Acetylbenzoylhydrazoxime.

Acetylcoumaroneoxime.

Aldoximes.

o-Aldoximophenylazo-*o*-aldoximoanilide.

*iso*Anisaldoxime.

Artemisininoxime.

Benzaldoximes.

Benzeneazocetonedicarboxylic acid, oxime of.

Benzilmono-oximes.

α -Benzylidenehydrindoneoxime.

Camphoroxime.

Carbanilinoacetophenoneoxime.

Coumaranoneoxime.

Diacetoneaminoxime.

2:5-Dibenzoylfurfuran, dioximes of.

Diisobutyl diketoxime.

Dicoumarylketoxime.

Diethyl diketoxime.

Dihydroxyquinoneoxime.

2:6-Diketo-4-*isopropyl*hexamethylene, dioxime of.

2:6-Diketo-3:4:4-trimethylhexamethylene, dioxime of.

Oximes. See :—

2:5-Dimethylbenzaldehyde, oxime of.

4:6-Dimethylcoumaranoneoxime.

1:4-Dimethyl-3-*cyclohexanone*oxime.

Dimethylketopentamethylenecarboxylic acid, oxime of.

$\beta\zeta$ -Dimethyl- $\beta\epsilon$ -octadiene- θ -al, oxime of.

$\alpha\alpha$ -Dimethylolpropaldehyde, oxime of.

Dimethylpyruvic acid, oxime of.

Dipropyl diketoxime.

Ethylacetaldoximes.

Ethylacetophenoximes.

Ethylacetoximes.

Glyceraldoxime.

Glyceuronolactone, oxime of.

Granatonineoxime.

5-Hydroxy-3-methoxy-*p*-xyloquinone-oxime.

Hydroxynaphthaldehyde, oxime of.

Indiazoneoxime.

Ketoximes.

Ketoximohydroxyethoxydihydropentanthrene.

Laurenonehydroxylamino-oxime.

Limonenoxime.

Δ^8 -Menthene-2-oneoximes.

Methylacetaldoximes.

Methylacetophenoximes.

Methylacetoximes.

4-Methyl-2-*isobutylcyclopentanone*-oxime.

Methylcoumaranoneoximes.

Methylethylacetoxime.

Methylethylketotetramethylenetricarboxylic acid, oxime of.

β -Methylhydrindoneoxime.

Opianic acid, *N*-phenyloxime of.

Oxalyltrimethylacetacetic acid, oxime of.

Phenacyllævulic acid, dioxime of.

γ -Phenacyl- γ -phenylpyrotartaric acid, oxime of.

Pheno- α -ketoheptamethylene, oxime of.

Phenylacetylacetophenoneoxime, *iso*-nitroso-.

Phthalaldehydic acid, *N*-phenyloxime of.

Propionylformic acid, oxime of.

Propylacetaldoximes.

Propylacetoximes.

Quinolylenephylene ketoxime.

Succindialdoxime.

$\Delta^{1,4}$ -Terpadiene-3-oxime-6-one.

Terpineneoxideoxime.

Tetraphenylcyclopentenoloneoxime.

2-*o*-Tolyldiketohydrindene, dioxime of.

5-*p*-Tolyl-3-methylcyclohexenone-oxime.

Triazobenzaldoxime.

Undecenamidoxime.

***o*-Oxyazo-compounds**, bromination of, and its bearing on their constitution (HEWITT and PHILLIPS), T., 160; P., 1900, 223.

***iso*Oxyazolonophenylhydrazone**, amino-, and its acetyl derivative (BERTINI), A., i, 776.

Oxycellulose (MURUMOW, SACK, and TOLLENS; TOLLENS), A., i, 453.

properties of (VIGNON), A., i, 16.

detection of (PHILIP), A., ii, 288.

Oxycelluloses (NASTUKOFF), A., i, 315.

Oxydase in cerebro-spinal fluid (CAVAZ-ZANI), A., ii, 257.

in pus (VITALI), A., ii, 672.

in valerian (CARLES), A., i, 59.

in yeast (GRÜSS), A., ii, 615.

role of, in the preparation of commercial black tea (ASÖ), A., ii, 679.

and peroxydase reactions (HUNGER), A., i, 784.

Oxydases, study of the (SARTHOU), A., i, 624.

action of, on the production of transitory starch, and detection of (GRÜSS), A., ii, 33.

4:5-Oxy-1:3-diphenyl-4-methylosotriazole and *d*initro- (PONZIO), A., i, 169.

Oxygen, evolution of, from the decomposition of chlorates (SODEAU), T., 247; P., 1900, 209.

evolved by *Bacillus pyocyaneus* (PAKES and JOLLYMAN), T., 322; P., 1900, 189.

basic properties of (v. BAEYER and VILLIGER), A., i, 658.

analogies between carbon, nitrogen and, in similar linkings (ERLENMEYER), A., i, 61.

combination of, with silver (BERTHELOT), A., ii, 97.

and carbon monoxide, reactions of, in presence of alkalis (BERTHELOT), A., ii, 17.

the rendering active of (ENGLER and FRANKENSTEIN), A., i, 657; (MANCHOT), A., ii, 93.

active, obtained by electrolysis (BOEHRINGER & SONS), A., ii, 649.

formation of, by ferrous oxide (MANCHOT and GLASER), A., ii, 549.

action of, on smooth muscle (CLEGHORN and LLOYD), A., ii, 255.

absorption of, by yeast (HARDEN and ROWLAND), T., 1231; P., 1901, 189.

role of, in germination (MAZÉ), A., ii, 32.

estimation of the amounts of, absorbed by proteids exposed to the air (NENCKI and ZALESKI), A., ii, 688.

Oxygen, estimation of, in commercial copper (LUCAS), A., ii, 124.

estimation of dissolved, in natural waters (WINKLER), A., ii, 696.

estimation of dissolved, in waters in presence of nitrites and of organic matter (RIDEAL and STEWART), A., ii, 472.

Oxygenated compounds, density of, in relation to constitution and composition (KANONNIKOFF), A., ii, 305.

Oxyhæmoglobin. See under **Hæmoglobin**.

5-Oxy-1-methyl-6:7-dihdropurine. See Deoxyheteroxanthine.

5-Oxy-4-methyl-6:7-dihdropurine. See 4-Methyldeoxyxanthine.

2-Oxy-7-methylpurine, and its salts (GABRIEL and COLMAN), A., i, 428.

5-Oxy-1- and -4-methylpurines (TAFEL and WEINSCHENK), A., i, 106.

Oxynitroloformic acid, ethylester (SCHOLL and SCHÖFER), A., i, 359.

2-Oxy-3-phenylpurine, 5:7- and 7:5-chloroamino- (FOURNEAU), A., i, 238.

4:5-Oxy-1:3:4-triphenylosotriazole and *hex*anitro- (PONZIO), A., i, 170.

Ozone, molecular weight of (LADENBURG), A., ii, 232; (OTTO), A., ii, 330.

density of (LADENBURG), A., ii, 499.

action of, on substances containing sulphur and on sulphur (WEYL), A., ii, 311.

estimation of (BRUNCK), A., ii, 38; (LADENBURG and QUASIG), A., ii, 420.

P.

Palladium, diffusion of hydrogen through (WINKELMANN), A., ii, 646.

estimation and separation of, in platinum ores (LEIDIÉ), A., ii, 62;

(LEIDIÉ and QUENNESSEN), A., ii, 695.

Palm cake and kernels. See **Agricultural Chemistry**.

Palmitic anhydride. See **Hexadecic anhydride**.

Palmitin, specific heat of (VANDEVYVER-GRAT), A., ii, 47.

Panama wood, presence of sucrose in (MEILLÈRE), A., ii, 185.

Pancreas and its ferments, immunity in relation to the (DEAN), A., ii, 563.

lactase of the (WEINLAND), A., ii, 30.

composition of calculi from the (LEGRAND), A., ii, 566.

Pancreatic juice, properties of, in starving animals (WERTHEIMER; CAMUS and GLEY), A., ii, 324.

Pannaric acid (HESSE), A., i, 596.

- Papain proteolysis**, products of (MENDEL and UNDERHILL), A., i, 355.
- Papaveraceæ**, alkaloids of the (SCHMIDT), A., i, 742.
- Papaverinol** and its derivatives (STUCHLIK), A., i, 41.
- Papayotin**, coagulating action of, on solutions of peptone (KURÁEFF), A., i, 435.
- Paraffins** in tobacco leaf (THORPE and HOLMES), T., 982; P., 1901, 170; (KISSLING), A., ii, 680.
- Paraffins**, nitro-, condensation products of (SCHOLL), A., i, 359.
- dinitro-*, formation of (PONZIO), A., i, 577.
- Paraformaldehyde**. See under Formaldehyde.
- Paranucleic acid** (LEVENE and ALSBERG), A., i, 300.
- and its iron and copper derivatives (SALKOWSKI), A., i, 242, 434.
- Parasitic worms**, glycogen in (WEINLAND), A., ii, 258.
- Paris green**, estimation of arsenic in (AVERY and BEANS), A., ii, 346, 623.
- Parasite**. See Synchrony.
- Paris quadrifolia*, occurrence of sucrose in the fruit of (KROMER), A., ii, 618.
- Parthenogenesis**, artificial (LOEB; Y. and M. DELAGE), A., ii, 177; (DELAGE), A., ii, 611; (GIES; MATHEWS), A., ii, 665.
- Peas**. See Agricultural Chemistry.
- Peat**, analysis of (BORNTRÄGER), A., ii, 212.
- See also Agricultural Chemistry.
- Peat-meal**. See Agricultural Chemistry.
- Pectenine** and its platinichloride (HEYL), A., i, 738.
- Pectins** (TOLLENS), A., i, 453.
- Peganum Harmala*, alkaloids of (FISCHER), A., i, 405.
- Pelargonic acid**. See Nononic acid.
- Penicillium brevicaulis*. See Arsenic mould.
- Pentacetyldextrose** (COLLEY), A., i, 671.
- Pentadecanaphthene**, chloro- (MABERY and SIEPLEIN), A., i, 306.
- cyclo***Pentadiene**, oxidation of (ENGLER and FRANKENSTEIN), A., i, 658.
- derivatives of (NOELDECHEN), A., i, 61.
- potassium derivative (THIELE), A., i, 182.
- dibromides* (THIELE), A., i, 181.
- Pentaglycerol**. See Trihydroxypentane.
- 2:4:6:3:4'-Pentamethoxybenzoylacetophenone** (V. KOSTANECKI, RÓŻYCKI, and TAMBOR), A., i, 92; (V. KOSTANECKI), A., i, 335; (DILLER and V. KOSTANECKI), A., i, 476.
- Pentamethylbenzene**, bromination and iodination of (EDINGER and GOLDBERG), A., i, 23.
- 1:2:2:5:5-Pentamethylpyrrolidine**, 3-amino-, and its thiocarbamates (PAULY and SCHAUM), A., i, 607.
- Pentane**, chlorodibromo- (KRASSUSKY), A., i, 247.
- Pentane** (*γ-methylbutane*), *αγ*-dibromo-, action of zinc dust on (IPATIEFF), A., i, 305.
- iso***Pentane**, thermal properties of, compared with those of *n*-pentane (ROSE-INNES and YOUNG), A., ii, 644.
- Pentanedicarboxylic acids**. See:—
Dimethylglutaric acid.
Ethylglutaric acid.
- Pentanetetracarboxylic acid**. See Methylbutanetetracarboxylic acid.
- Pentanetricarboxylic acids**. See:—
Dimethylpropane-*αγγ*-tricarboxylic acid.
Ethyltricarballic acid.
Methylbutanetricarboxylic acid.
- 2-cycloPentanolcarboxylic acid**, and its salts and ethyl ester (DIECKMANN), A., i, 540.
- cyclo***Pentanone** and its carboxylic acid and ethyl ester (DIECKMANN), A., i, 539.
- Pentanthrene** and its derivatives (LIEBERMANN and LANSER), A., i, 466.
- n*-**Pentenecarboxylic acid**. See Hexenoic acid.
- cyclo***Pentene-1-carboxylic acid**, 2-amino-, ethyl ester (DIECKMANN), A., i, 539.
- β-Pentene-3-ol** and its acetate, synthesis of (GRIGNARD), A., i, 679.
- Pentenoic acid** (*angelic acid*), hydriodide of, *ψ*-butylene from (WISLIGENUS, TALBOT, and HENZE), A., i, 2.
- β*-bromo- (WISLIGENUS and HENZE), A., i, 4.
- Pentenoic acid** (*dimethylacrylic acid*), conversion of, into dimethylpyruvic acid (BOUVEAULT and WAHL), A., i, 252.
- amino-, ethyl ester, and its carbamide and phenylcarbamide (BOUVEAULT and WAHL), A., i, 114.
- nitro-, ethyl esters, isomeric (BOUVEAULT and WAHL), A., i, 4, 5, 664.
- action of reducing agents on (BOUVEAULT and WAHL), A., i, 114.
- Pentenoic acid** (*β-methylcrotonic acid*), *α*-cyano-, ethyl ester (KOMPPA), A., i, 114.
- Pentenoic acid** (*tiglic acid*), formation of (KROMER), A., i, 629.

- Pentenoic acid** (*tiglic acid*), hydriodide of, ψ -butylene from (WISLICENUS, TALBOT, and HENZE), A., i, 2.
 β -bromo- (WISLICENUS and HENZE), A., i, 4.
*cyclo***Pentenyl-diphenylcarbamide**, -di-phenylthiocarbamide, and -phenylhydrazine (NOELDECHEM), A., i, 61.
Pentinene, complete synthesis of (BERTHELOT), A., i, 247.
Pentosans, quantity of, in fruits and vegetables (WITTMANN), A., ii, 414.
 amount of, in gum arabic (HEFELMANN), A., ii, 535.
 of brewers' grains, jute, and luffa (SCHÖNE and TOLLENS), A., ii, 414.
 of seeds, behaviour of the, during germination (SCHÖNE and TOLLENS), A., ii, 267.
 estimation of, by means of the hydrochloric acid phloroglucinol method (KRÖBER), A., ii, 288, 371; (FRAPS), A., ii, 536.
Pentoses, fermentation of (SCHÖNE and TOLLENS), A., i, 367.
Pepsin, nature of (NENCKI and SIEBER), A., ii, 401.
 action of, on proteids (LAWROFF; DZIERZGOWSKI and SALASKIN), A., ii, 666.
 quantitative action of (KRÜGER), A., ii, 561.
Peptase in malt (WEIS), A., ii, 69.
Peptic activity, Mett's method of estimating (SAMOJLOFF), A., ii, 401.
Peptone, coagulating action of papayotin on solutions of (KURAÉEFF), A., i, 435.
 detection of, in urine and fæces (FREUND), A., ii, 710.
Peptone-serum product, crystalline (BUCHNER and GERET), A., i, 783.
Peptones from albumin (PAAL), A., i, 623.
 albumins, albumoses, and syntonins of muscular tissue, differentiation between (BILTÉRYST), A., ii, 632.
Perchloric acid. See under Chlorine.
Periodicity, effect of various compounds in increasing the, of an alloy of aluminium and chromium (OSTWALD), A., ii, 24.
Perkin reaction, study of the (MICHAEL and HARTMAN), A., i, 358.
Perovskite from Enarese in Val d'Aosta (MILLOSEVICH), A., ii, 398.
Peroxides, action of, on toxins (SIEBER), A., ii, 566.
Phthalic acid. See under Phthalic acid.
Persulphuric acid. See under Sulphur.
- Petroleum**, theories of the origin of (KLEMENT), A., ii, 319.
 in fossiliferous limestone from Baden (ENGLER and ALBRECHT), A., ii, 662.
 Roumanian, nitrogenous bases in (GRIFFITHS and BLUMAN), A., i, 609.
 Russian, organic bases of (CHLOPIN), A., i, 42.
 occurrence of, in Texas (PHILLIPS), A., ii, 662.
 Texas, composition of (MABERY), A., i, 441.
 See also Naphtha and Shale oil.
Petzite from Coolgardie (RICKARD), A., ii, 663.
 from Western Australia (KRUSCH), A., ii, 393.
 See also Tellurides of gold and silver.
- Phases**, liquid and vapour, determination of the refractive power as a method for the investigation of the composition of co-existing (CUNAEUS), A., ii, 213.
 See also under Equilibrium.
- Phellandrene**, constitution of, and reactions of its nitrite (WALLACH and H. and E. LAUFFER), A., i, 89.
 nitrite (SCHREINER), A., i, 600.
- Phenacetin**, colour reaction of, with potassium permanganate (MAAS), A., ii, 210.
- Phenacetylisobutyric acid**, ethyl ester (BLAISE), A., i, 253.
- Phenacyl benzyl ketone**. See Phenylacetylacetophenone.
- Phenacylidenebenzamidine** and its salts, phenylhydrazone, and ethiodide (KUNCHELL), A., i, 294; (KUNCHELL and BAUER), A., i, 758.
- Phenacylidene-p-tolenylamidine** and its hydrochloride (KUNCHELL and BAUER), A., i, 758.
- Phenacyllævulic acid** and its salts and dioxime (KEHRER), A., i, 389.
- Phenacylphenacetin** (GOLDSCHMIDT), A., i, 643.
- γ -Phenacyl- γ -phenylpyrotartaric acid**, and its esters, salts, anhydride and oxime (STOBBE and RUSSWURM), A., i, 147.
- Phenanthraquinone**, action of phenylhydrazine on (BAMBERGER and GROB), A., i, 280.
- Phenanthrarosinduline** and its dichromate (KEHRMANN and EICHLER), A., i, 421.
- Phenanthrazoxonium** *perbromide* (KEHRMANN), A., i, 484.

- Phenanthrene**, 9-amino-, and its acyl derivatives and picrate (SCHMIDT and STROBEL), A., i, 464.
 nitro- (m. p. 116—117°) (SCHMIDT), A., i, 76.
- ψ -**Phenanthroline-1:3-dicarboxylic acid** (4:7-*quinoxaline-1:3-dicarboxylic acid*) (WILLGERODT and JABLONSKI), A., i, 50.
- Phenanthroxazine** (JAPP and DAVIDSON), A., i, 401.
 and its acetyl derivative (BAMBERGER and GROB), A., i, 280.
- Phenanthrylamines**, 2- and 3-, and their acetyl derivatives (WERNER and KUNZ), A., i, 696.
- 9-Phenanthryl-phenylcarbamide**, -phenylthiocarbamide, and -urethane (SCHMIDT and STROBEL), A., i, 464.
- Phenazine-5:10-oxide** (WOHL and AUE), A., i, 612.
- Phenethylidene-** and **Phenethyl-pyrotartaric acids**, and **Phenethylitaconic acid** (FICHTER and HIRSCH), A., i, 594.
- p*-**Phenetidine**, chloroacetyl, phenylsulphonacetyl, *p*-tolylsulphonacetyl, thiodiglycolyl, sulphonodiacetyl, and thiocyanacetyl derivatives of (GROTHE), A., i, 79, 80.
- Phenetole**, action of sulphuric acid on (SCHOBER and BOWERS), A., i, 204.
- Phenetolecarbamide**. See "Dulcin."
- Phenethylmercuric salts** (DIMROTH), A., i, 440.
- 4-Phenetyl-4-methyltrimethylenediacarbonimide**, 3:5-dicyano- (GUARESCHI and BALDI), A., i, 346.
- Pheno- α -aminoheptamethylene** and its salts and benzoyl derivatives (KIPPING and HUNTER), T., 609; P., 1901, 68.
- Pheno- α -ketoheptamethylene** and its oxime and semicarbazone; and oxidation of (KIPPING and HUNTER), T., 606; P., 1901, 68.
- Phenol**, electrolysis of, in presence of hydrogen haloids (ZEHLANT), A., i, 382.
 determination of the avidity of, by the thermochemical method (LOTNIKOFF), A., ii, 229.
 distillation of dilute aqueous solutions of (NAUMANN and MÜLLER), A., i, 204.
 equilibrium between acetone, water and (SCHREINEMAKERS), A., ii, 445.
 composition of the vapour phase of the system, aniline, water, and (SCHREINEMAKERS), A., ii, 57.
 composition of the vapour phase in the system water and, with one or two liquid phases (SCHREINEMAKERS), A., ii, 9, 57.
- Phenol**, action of, on benzylidene chloride (MACKENZIE), T., 1216; P., 1901, 150.
 action of diazobenzene on (BAMBERGER), A., i, 107.
 action of Millon's reagent on (VAUBEL), A., i, 28.
 substitution in (LAPWORTH), T., 1267.
 characteristic reaction of (FIORA), A., ii, 425; (MANSEAU), A., ii, 697.
 titration of (TELLE), A., ii, 357.
 estimation of, volumetrically (TOCHER), A., ii, 353.
 estimation of, in dressings (TELLE), A., ii, 698.
 estimation of, when mixed with resinous substances, in surgical dressings (THRESH), A., ii, 698.
 See also Carbolic acid.
- Phenol**, *o*-amino-, condensation of, with phenoxyacetic acid and its derivatives (COHN), A., i, 752.
- 2:6-dibromo-4-amino-**, and its benzoyl derivative (FORSTER and ROBERTSON), T., 690; P., 1901, 116.
- 2:6-dibromo-4-nitroso-**, preparation of, and its acetyl, benzoyl and potassium derivatives; the action of nitric acid on, and reduction of (FORSTER and ROBERTSON), T., 686; P., 1901, 116.
- chloro-** and **chloronitro-**derivatives of (TARUGI), A., i, 146.
- pentachloro-**, preparation of (BARRAL and JAMBON), A., i, 27.
- 2:4-di-** and **2:4:6-tri-iodo-**, ethers and esters of (BRENANS), A., ii, 322, 643.
- p*-nitro-**, reduction of, by hyposulphurous acid (GOLDBERGER), A., i, 23.
- 2:4:6-trinitro-**. See Picric acid.
- 3:5-dinitro-4-nitroso-** (NIETZKI and DIETSCHY), A., i, 197.
- Phenol ethers**, hydrolysis of, by alcoholic potash (STOERMER and KAHLERT), A., i, 533.
- p*-nitro-** and ***p*-amino-**, and their salts and carbamide derivatives (SPIEGEL and SABBATH), A., i, 533.
- Phenols**, oxidation of, in air (MANCHOT), A., ii, 93.
 condensation of, with esters of the acetylene series (RUHEMANN and BAUSOR), T., 470; P., 1901, 40; (RUHEMANN and WRAGG), T., 1185; P., 1901, 187.
 condensation of, with benzilic acid (BISTRZYCKI and NOWAKOWSKI), A., i, 716.
 action of, on ethyl oxalate (TINGLE and O'BYRNE), A., i, 533.

- Phenols**, condensation products of haloid derivatives of hydroxytolualdehyde and hydroxytoluic acid with (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 712.
displacement of alkyls from, by nitration (LARTER), P., 1901, 183.
substances formed in the iodination of (VAUBEL), A., i, 143.
chlorocarbonates of (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 697.
aldoximes of, synthesis of (SCHOLL and BERTSCH), A., i, 465.
- Phenols**, amino-, mechanism of the conversion of arylhydroxylamines into (BAMBERGER), A., i, 140, 203.
- Phenols**, list of. See Alcohols and Phenols.
- o*-Phenolsulphonebenzoic chloride, *p*-nitro- (NORRIS), A., i, 134.
- Phenonaphthoxazone**, and 5-*mono*- and 2:5-*di*-amino-and its diacetyl derivative (KEHRMANN and BARCHE), A., i, 48.
- iso*Phenosafraanine, preparation and acetyl derivatives of (KEHRMANN and KRAMER), A., i, 52.
- Phenoxazonium** picrate (KEHRMANN), A., i, 484.
- Phenoxide**, sodium, condensation of, with derivatives of α -bromo-fatty acids and methyl- and ethyl-aniline (BISCHOFF), A., i, 526.
condensation of, with derivatives of α -bromo-fatty acids and benz-aniline, diphenylamine, and carbazole (BISCHOFF), A., i, 527.
condensation of, with α -bromo-fatty acid amides, toluidides, naphthalides, and nitroanilides (BISCHOFF), A., i, 524, 525.
nitrodithio-, sodium, action of iodine on (BLANKSMA), A., i, 462.
- Phenoxides**, *pentachloro*-, metallic (JAMBON), A., i, 28.
- Phenoxyacetamidines**, aromatic (COHN), A., i, 352.
- Phenoxyacetic acids**, condensation of, with *o*-aminophenol (COHN), A., i, 752.
- Phenoxyacetic anhydride** (CHEMISCHE FABRIK AUF AKTIEN (SCHERING)), A., i, 708.
- Phenoxyacetylmethylanilide** (BISCHOFF), A., i, 526.
- Phenoxybenzoic acid**, 4-*o*-nitro-, and its salts (COOK and HILLYER), A., i, 144.
- α -Phenoxybutyryl chloride (BISCHOFF), A., i, 526.
- β -Phenoxyisobutyryl-*p*-nitroanilide (BISCHOFF), A., i, 526.
- β -Phenoxycrotonic acid and its ethyl ester (RUHEMANN and WRAGG), T., 1189; P. 1901, 188.
- Phenoxymethoxyethoxy-anilinosilicon** and -menthoxy-silicon (KIPPING and LLOYD), T., 458; P., 1901, 32.
- Phenoxymethoxy-silicon** *dichloride* and -ethoxy-silicon chloride (KIPPING and LLOYD), T., 457; P., 1901, 32.
- 1-Phenoxymethylbenzoxazole** (COHN), A., i, 752.
- 2-Phenoxymethyl-5-methyl- and -6-ethoxy-benziminazoles** and their salts (COHN), A., i, 352.
- Phenoxydinitrophenylmalonic acid**, ethyl ester (JACKSON and COHOE), A., i, 585.
- 5-Phenoxy-1-phenylpyridazone**, 4-bromo- (BISTRZYCKI and HERBST), A., i, 386.
- α -Phenoxy-propionyl- and -butyryl-diphenylamides (BISCHOFF), A., i, 527.
- α -Phenoxy-propionyl- and -butyryl-ethyl-anilides (BISCHOFF), A., i, 527.
- α -Phenoxy-propionyl-, and -*n*- and -*iso*-butyryl-methylanilides (BISCHOFF), A., i, 526.
- α -Phenoxy-propionyl-, -*n*- and -*iso*-butyr-, and -*isovaler*-amides and -anilides (BISCHOFF), A., i, 524.
- α -Phenoxy-propionyl-, -*n*- and -*iso*-butyryl- and -*isovaleryl*-benzylanilides (BISCHOFF), A., i, 527.
- α -Phenoxy-propionyl-, -*n*- and -*iso*-butyryl-, and -*isovaleryl-o*-, -*m*-, and -*p*-nitroanilides (BISCHOFF), A., i, 525.
- α -Phenoxy-propionyl-, -*n*- and -*iso*-butyryl- and -*isovaleryl-o*-, -*m*-, and -*p*-toluidides and - α - and - β -naphthalides (BISCHOFF), A., i, 525.
- 2- γ -Phenoxypropyldihydroisindole** and its salts (FRÄNKEL), A., i, 45.
- β -Phenoxypropylene** (RUHEMANN and WRAGG), T., 1190; P., 1901, 188.
- Phenoxy-*p*-tolyl-*oxy*-isopropyl chloride** and -isopropylphosphorous acid (BOYD), T., 1226; P., 1901, 189.
- Phenyl borate** (MICHAELIS and HILLRINGHAUS), A., i, 356.
alkyl carbonates, *pentachloro*-, preparation of (BARRAL), A., i, 28.
carbonates (CHEMISCHE FABRIK VON HEYDEN), A., i, 696.
telluride (STEINER), A., ii, 236.
p-tolyl ether, *o*-amino- and *o*-nitro- (COOK and HILLYER), A., i, 144.
p-tolyl sulphate, sulphide, and hydrochloride, amino- (v. MEYER, NACKE, and GMEINER), A., i, 265.
- Phenylacetic acid**, *o*-chloro-, and its esters, amide, thioamide, nitrile, anilide, toluidides, and phenylhydrazide (MEHNER), A., i, 208.

- Phenylacetic acid**, *p*-chloro- and its anilide, toluidides, phenylhydrazide, 2:5-dinitro- and benzoyl derivatives (MEHNER), A., i, 209.
- o*-nitro-, methyl ester (GOLDSCHMIDT), A., i, 709.
- ψ -Phenylacetic acid. See Norcaradiene-carboxylic acid.
- Phenylacetoneitrile** (*benzyl cyanide*), action of dry silver oxide and ethyl iodide on (LANDER), P., 1901, 59.
- Phenylacetylacetophenone** (*phenylacetylbenzoylmethane*; *phenacyl benzyl ketone*) and isonitroso-, and oxime and semicarbazone of the isonitroso- (BÜLOW and GROTOWSKY), A., i, 475.
- Phenylacetylmethylamide**, *p*-nitro- (ORTON), T., 1353; P., 1901, 200.
- β -Phenylacrylic acid**. See Cinnamic acid.
- 3-Phenyladenine** and its salts (FOURNEAU), A., i, 238.
- Phenylalanine** (FISCHER), A., i, 781. from egg-albumin and gelatin (FISCHER), A., i, 745.
- i*-Phenyl- α -alanine ethyl ester (FISCHER), A., i, 193.
- Phenylamino-**. See Anilino-.
- δ -Phenyl- β -amino- β -heptene- ζ -one- γ -dicarboxylic acid, diethyl ester, isomerism of (RABE), A., i, 147.
- p*-Phenylaminophenylglyoxylic acid and its phenylhydrazone (BOEHRINGER & SONS), A., i, 714.
- Phenyl-*p*-amino-*o*-tolylsulphone** (NORRIS), A., i, 134.
- Phenylisocamylcarbinol** and its acetate (GRIGNARD), A., i, 679.
- 3-Phenyl-5-amylpyrazole** (MOUREU and DELANGE), A., i, 352.
- Phenylanilino α -thiodiazolone** (BUSCH and HOLZMANN), A., i, 235.
- 1-Phenyl-4-anilinourazole** and its methyl and benzyl ethers and nitroso- and nitrosoamine derivatives (BUSCH), A., i, 489.
- 5-thio- (BUSCH and GROHMANN), A., i, 617.
- Phenylanisidinourazole** and its isomeride (BUSCH), A., i, 489.
- Phenyl-*p*-anisylcarbazine-1-carboxylic acids**, 2:5- and 5:2-, ethyl esters (BUSCH and GROHMANN), A., i, 616.
- Phenylaziminobenzene** (*phenylbenzotriazole*), ketochlorides, quinones, and acids of (ZINCKE and PETERMANN), A., i, 104.
- Phenylazo-**. See Benzeneazo-.
- Phenylbenzenylthioureaphenylamidine** (WHEELER), A., i, 487.
- Phenylbenzimidazole**, 2-*p*-amino- (KYM), A., i, 47.
- Phenylbenzimidazole**, β -amino-, the three isomeric, and their salts, and acetyl and benzoyl derivatives and thiocarbamides of the *m*- and *p*-compounds (MIKLASZEWSKI and V. NIEMENTOWSKI), A., i, 760.
- 7-Phenylbenzotriazin-8-one-5-*p*-benzoic acid** (FULDA), A., i, 226.
- Phenylbenzotriazole**. See Phenylaziminobenzene.
- Phenylbenzoxazole**, 1-*p*-amino- (KYM), A., i, 47.
- Phenylbenzyltrimethylammonium iodide** and *d*-camphorsulphonate (JONES), A., i, 376.
- Phenylbenzylhydrazine**, action of, on oxalacetic acid (FENTON and JONES), T., 97; P., 1900, 205; 1901, 26.
- Phenylbenzylidene-*p*-phenylenediamine**, *o*- and *p*-nitro- (BANDROWSKI), A., i, 49.
- Phenyl- β -benzylmethylallylammonium salts**, *d*- and *l*- (POPE and HARVEY), T., 828; P., 1901, 120.
- 1-Phenyl-4-benzyl-3-methyl-pyrazole**, and -pyrazolone, and the 5-chloro-derivative of the pyrazole (MICHAELIS, VOSS, and GREISS), A., i, 409.
- β -Phenyl- γ -benzyl- $\alpha\beta$ -naphthylhydroxyamidine and its salts (LEY), A., i, 760.
- 3 (or 5)-Phenyl-5 (or 3)-benzyl-isooxazole and -pyrazole** (BÜLOW and GROTOWSKY), A., i, 475.
- 2-Phenyl-4-benzylsemicarbazide-1-carboxylic acid**, ethyl ester (BUSCH and HEINRICHS), A., i, 617.
- 1:4-Phenylbenzylurazole** (BUSCH and HEINRICHS), A., i, 617.
- Phenylbiuret** (PICKARD and CARTER), T., 843; P., 1901, 123.
- α -Phenylbiuret (MCKEE), A., i, 757.
- Phenylborobromide** (MICHAELIS and RICHTER), A., i, 355.
- Phenylbromohomocampholic acid** (HALLER and MINGUIN), A., i, 599.
- α -Phenylbromopiperonylcinnamionitrile (BISTRZYCKI and STELLING), A., i, 718.
- β -Phenyl-*n*-butane- $\alpha\gamma\delta$ -tricarboxylic acid and its salts and trimethyl ester (STOBBE and FISCHER), A., i, 276.
- β -Phenyl- β -butenoic acid (β -phenylvinylacetic acid), γ -cyano- (GUARESCHI and PEANO), A., i, 631.
- Phenylisobutylcarbinol** and its acetate (GRIGNARD), A., i, 679.
- N*-Phenylbutylene- ψ -thiocarbamide** (STRAUSS), A., i, 17.
- β -Phenylbutyric acid**, dithio-, ethyl ester, its α -mono- and -di-methyl and -ethyl derivatives (POSNER and CLAUDIUS), A., i, 705.

- Phenylbutyrolactoneacetic acid and its salts (FITTIG and SALOMON), A., i, 122.
- Phenylcarbamino-dimethylacrylic acid (BOUVEAULT and WAHL), A., i, 114.
- Phenylcarbimide (*phenyl isocyanate*), action of, on diphenyl-, diallyl-, and dinaphthyl-diamines (SENIER and GOODWIN), T., 258; P., 1900, 228.
action of, on ethyl phenyl-thiol- and -thion-carbazinate (WHEELER and DUSTIN), A., i, 25.
- Phenylcarbimino-2-pyrrolidinecarb-
oxylic acid and anhydride (FISCHER), A., i, 191.
- Phenylchloroacetyl-drindamides, isomeric (KIPPING and HALL), T., 445; P., 1901, 36.
- 1-Phenyl-4-dichloromethyl-5-dichloro-
ethylene-1:2:3-triazole (ZINCKE and PETERMANN), A., i, 106.
- Phenylisocrotonic acid, polymeric (FITTIG), A., i, 145.
- Phenyldibenzylaminourazole (BUSCH), A., i, 489.
- 2-Phenyl-4:5-dibenzylcarbazide-1-carb-
oxylic acid, ethyl ester (BUSCH), A., i, 616.
- 2-Phenyl-5-dibenzylcarbazide-1-carb-
oxylic acid, ethyl ester (BUSCH), A., i, 489.
- Phenyldibenzylmethylammonium
iodide, *d*-camphorsulphonate, and *d*-
bromocamphorsulphonate (JONES), A., i, 376.
- Phenyldibenzylurazine (BUSCH), A., i, 616.
- Phenyldicarbylamine and its isomeride (SABANÉEFF and PROSIN), A., i, 695.
- Phenyldiethylaminourazole (BUSCH), A., i, 489.
- 2-Phenyl-5-diethylcarbazide-1-carb-
oxylic acid, ethyl ester (BUSCH), A., i, 489.
- α -Phenyl- γ -diethylsulphonebutane- α -
one (POSNER), A., i, 15.
- Phenyldihydropyrimidyl mercaptan (WOHL and WOHLBERG), A., i, 514.
- Phenyldimethylammoniumiodoacetic
acid, ethyl ester (WEDEKIND), A., i, 640.
- Phenyldimethylcarbinol (GRIGNARD), A., i, 680; (BOEDTKER), A., i, 684.
- 2-Phenyl-1:3-dimethyl-1:3-dibenzoyl-
propane and its isomeride, and the
action of ammonia and hydroxylamine
hydrochloride on (ABELL), T., 933;
P., 1901, 128.
- 2-Phenyl-4:5-dimethyl-oxazoline and
-thiazoline and their pierates and
platinichlorides (STRAUSS), A., i, 18.
- 1-Phenyl-3:4-dimethylpyrazole, 5-halo-
gen and nitro- and amino-derivatives,
and their salts (MICHAELIS, VOSS, and
GREISS), A., i, 407.
- 1-Phenyl-2:3-dimethyl-5-pyrazolone.
See Antipyrine.
- 1-Phenyl-2:5-dimethyl-1:3:4-triazole and
its salts (PELLIZZARI and ALCIATORE),
A., i, 571.
- Phenyldi- β -naphtholmethane, and its
acetyl derivative and anhydride
(HEWITT and TURNER), A., i, 207.
- Phenyldiphenylene-ethane (WEISS-
GERBER), A., i, 521.
- Phenyldi-*p*-tolylphosphine derivatives
(MICHAELIS and EIFLER), A., i, 304.
- Phenylealdehydylthiocarbamide (KRAFFT
and TRITSCHLER), A., i, 116.
- p*-Phenylenedichlorodipropionic acid
(EPHRAIM), A., i, 689.
- o*-Phenylenediamine, action of, on isatin
(MARCHLEWSKI and BURACZEWSKI),
A., i, 347.
- m*-Phenylenediamine, action of ethyl
acetonedicarboxylate on (BESTHORN
and GARBEN), A., i, 97.
5-chloro-, and its salts and diacetyl
and dibenzoyl derivatives (COHN),
A., i, 407.
- Phenylenediamines, *o*-, *m*-, and *p*-,
action of, on 2:3-dibromo- α -naphtha-
quinone (LINDENBAUM), A., i, 423.
- 1:3-Phenylenediamine-4-sulphonic acid,
6-nitro- (BADISCHE ANILIN- and SODA-
FABRIK), A., i, 755.
- m*-Phenylenediaminethiosulphonic acids
(CLAYTON ANILINE CO.), A., i, 694.
- p*-Phenylenediisobutyric acid (EPHRAIM),
A., i, 689.
- Phenylenedicarbylamines, *m*- and *p*-
(KAUFLER), A., i, 462.
- p*-Phenylenediethylene, ω -dibromo-
(EPHRAIM), A., i, 688.
- o*-Phenylenemethyldiamine, 4-chloro-
and its hydrochloride (KEHRMANN
and MÜLLER), A., i, 419.
- α -Phenylethoxycinnamonitriles and
their bromides (BISTRZYCKI and STEL-
LING), A., i, 719.
- Phenylethyl alcohol. See Benzylcarb-
inol.
- Phenylethylisobiuret and its hydro-
chloride (MCKEE), A., i, 757.
- Phenylethylisocarbamide and its salts
and benzoyl derivatives (MCKEE), A.,
i, 755.
- β -Phenyl- α -ethylisocrotonic acid, thio-
(POSNER and CLAUDIUS), A., i, 705.
- α -Phenylethylidiguamide (CRAMER), A.,
i, 772.
- Phenylethylidenebistetronic acid
(WOLFF and GABLER), A., i, 284.

2-Phenyl-1-ethylindole, 3-*mono*- and *di*-nitro-, and the azoxy-compound of the *mononitro*- (ANGELI and ANGELICO), A., i, 46.

Phenyl ethyl ketone, condensation of, with benzaldehyde, and with benzylidenepropiophenone (ABELL), T., 928; P., 1901, 128.

Phenyl-5-ethyl-2-picolyalkine. See 5- β -Hydroxy- β -phenylethyl-2-ethylpyridine.

1-Phenyl-3-ethyl- and -3-propyl-pyrazolones (BLAISE), A., i, 363.

Phenylfluorindine, chloro- and nitro-, and the hydrochloride of the chloro-compound (KEHRMANN and GUGGENHEIM), A., i, 422.

Phenylgalactosido-galactosazone and -glucosazone and Phenylglucosido-galactosazone (FISCHER and ARMSTRONG), A., i, 190.

α -Phenyl-*o*-glucocoumaronitrile (FISCHER), A., i, 275.

Phenylglutaric acid, oxidation of (VORLÄNDER), A., i, 454.

Phenylglycine-*o*-carboxylic acid and its esters, amide, and thioamide (FARBWERK MÜHLHEIM FORM. A. LEONHARDT & Co.), A., i, 710.
nitrile of. See Methylanthranilic acid, ω -cyano-.

Phenylglycine-*o*-carboxylic acid, nitroso- (VORLÄNDER), A., i, 463.

Phenylglycolhydrazide and its hydrochloride and sodium salt (CURTIUS and MÜLLER), A., i, 779.

2-Phenylglyoxaline and its salts and its 1-methyl and 1-ethyl derivatives (WEWIORSKI), A., i, 353.

Phenylglyoxylic acid, *p*-amino- and its derivatives (BOEHRINGER & SONS), A., i, 713, 714.

Phenylguanazole and its acetyl derivatives and nitroso- (PELLIZZARI and RONCAGLIOLI), A., i, 772.

Phenylguanidine and its picrate, platinumchloride, and dibenzoyl derivative (MCKEE), A., i, 756.

Phenylguanidine, amino-, and its isomeric, reactions of (PELLIZZARI and RONCAGLIOLI), A., i, 768.

compounds of, with aldehydes and ketones (PELLIZZARI and RICKARDS), A., i, 769.

Phenylheptadecenoic acid (KRAFFT and ROSINY), A., i, 113.

Phenylcyclohexane (WILLSTÄTTER and LESSING), A., i, 265.

Phenylcyclohexylcarbamide (SCHALL), A., i, 766.

Phenylhydrazine, action of acetyl bromo- and acetyl chloro-amino-2:4-dichlorobenzenes on (CHATTAWAY and ORTON), T., 467; P., 1901, 39.

action of, on aldol and on crotonaldehyde (TRENER), A., i, 232.

action of, on β -chloroallylthiocarbimide (DIXON), T., 554; P., 1901, 49.

action of, on the isomeric methyl butyrylacetates (BONGERT), A., i, 409.

action of, on oxalacetic acid (FENTON and JONES), T., 91; P., 1900, 205.

action of, on phenanthraquinone and retenequinone (BAMBERGER and GROB), A., i, 280.

combination of, with ketones (PETRENKO-KRITSCHENKO and LORDKIPANIDZÉ), A., i, 505; (PETRENKO-KRITSCHENKO and ELTSCHANINOFF), A., i, 506.

hydrate and phenylcarbazinate (FREUNDLER), A., i, 776.
ureide. See Diphenylcarbazide.

2-Phenylhydrazine-4-methylpyrimidone and its salts, dibromide, and 5-ethyl derivative (PELLIZZARI and RONCAGLIOLI), A., i, 768.

2-Phenylhydrazinocyclopentene-1-carboxylic acid, ethyl ester (DIECKMANN), A., i, 539.

Phenylhydrazonocycanoacetic acid, ethyl ester, derivatives of (LAX), A., i, 230.

α -Phenylhydroxycinnamionitriles, and the action of bromine on, and their acetyl derivatives (BISTRZYCKI and STELLING), A., i, 718.

Phenylhydroxyethoxyquinoxaline, *o*-nitro- (MARCHLEWSKI and BURACZEWSKI), A., i, 347.

Phenylhydroxyhomocampholic acid, *p*-bromo- (HALLER and MINGUIN), A., i, 600.

β -Phenylhydroxylamine, action of toluene-*p*-sulphinic acid on (BAMBERGER and RISING), A., i, 202.

Phenyl-1-hydroxylamine, 2:4:6-*trinitro*- (NIETZKI and DIETSCHY), A., i, 197.

Phenylhydroxyoxamide, and its acetyl derivative, reactions of (PICKARD and CARTER), T., 842; P., 1901, 123.

2-Phenyl-6-*o*-hydroxystilbazole (2-phenyl-6-*o*-hydroxystyrylpyridine) and its salts (DEHNEL), A., i, 166.

Phenyliminobenzoyl cyanide, and its *p*-nitrobenzoyl derivative (SACHS), A., i, 272.

Phenyliminobenzoylformamide (SACHS), A., i, 272.

Phenyliminourazole and its salts (PELLIZZARI and RONCAGLIOLI), A., i, 773.

- 2-Phenylindole, 3-*mono*- and *di*-nitro-, and oxidation of the *mononitro*- (ANGELI and ANGELICO), A., i, 46.
- Phenylmercaptotetrazole (FREUND and PARADIES), A., i, 771.
- Phenylmercuric salts, amino- (DIMROTH), A., i, 440.
- Phenylmesitylhydroxycarbamide (BAMBERGER and RISING), A., i, 141.
- α -Phenyl-*p*-methoxycinnamionitrile and its bromo-derivatives (BISTRZYCKI and STELLING), A., i, 719.
- 3-Phenyl-5-*p*-methoxyphenylisooxazole and its isomeride (POND and SHOFFSTALL), A., i, 36.
- Phenylmethyl-*n*-acetylglutarimide- α -carboxylic acid (CARTER and LAWRENCE), P., 1900, 179.
- Phenylmethylallylcarbinol and its trihydric alcohol (ARBUSOF), A., i, 274.
- Phenylmethylaminourazole and its methyl ether (BUSCH), A., i, 489.
- 1-Phenyl-4-methylanilinouazole and its methyl ether (BUSCH), A., i, 616.
- Phenyl-3-methyl-4-benzeneazo-5-pyrazolone, 1-nitro- (BÜLOW and HÖPFNER), A., i, 240.
- Phenylmethylisobiuret and its hydrochloride (McKEE), A., i, 757.
- Phenylmethylcarbamic acid, 2:4-*di*- and 2:4:6-*tri*-nitro-, esters (VAN ROMBURGH), A., i, 201.
- Phenylmethylisocarbamide and its salts and benzoyl derivatives (McKEE), A., i, 756.
- α -Phenyl-*p*-methylcinnamionitrile (BISTRZYCKI and STELLING), A., i, 719.
- β -Phenyl- α -methylisocrotonic acid, thio- (POSNER and CLAUDIUS), A., i, 705.
- Phenylmethylcyanamide. See Methylcyananiline.
- β -Phenyl- α -methyl- α -cyanoglutaric acid, ethyl ester, and its isomeride, and the action of acetic chloride on (CARTER and LAWRENCE), P., 1900, 178.
- β -Phenyl- α -methyl- α -cyanoglutaric anhydride (CARTER and LAWRENCE), P., 1900, 179.
- Phenylmethylene and its dibromide (GRIGNARD), A., i, 681.
- 1-Phenyl-3-methyl-4-ethyl-pyrazole, and its salts and amino- and nitro-derivatives, and -pyrazoline and its nitro-derivative (MICHAELIS, VOSS, and GREISS), A., i, 408.
- Phenylmethylfulvene diperoxide (ENGELER and FRANKENSTEIN), A., i, 657.
- β -Phenyl- α -methylglutaric acid and its nitro-derivatives, and the action of acetic chloride on (CARTER and LAWRENCE), P., 1900, 180.
- Phenylmethylglutarimide- α -carboxylic acid and its isomeride, and the action of acetic chloride on (CARTER and LAWRENCE), P., 1900, 179.
- Phenylmethylguanazole (PELLIZZARI and RONCAGLIOLI), A., i, 772.
- β -Phenylmethylhydracrylic acid and its metallic salts (ARBUSOF), A., i, 275.
- s*-Phenylmethylhydrazine, mono- and di-acetyl derivatives of (EBERT and REUTER), A., i, 294.
- 2-Phenylmethylhydrazine-4-methylpyrimidone (PELLIZZARI and RONCAGLIOLI), A., i, 768.
- 3-Phenyl-1-methylhydroxytriazole, and *m*-nitro-, and acetyl and silver derivatives (YOUNG and OATES), T., 662; P., 1901, 86.
- 2-Phenyl-1-methylmercaptotriazole (YOUNG and OATES), T., 668; P., 1901, 86.
- Phenylmethylcyclomethylenetriazan and its hydrogen oxalate (VOSWINCKEL), A., i, 53.
- p*-chloro-, and its hydrochloride (VOSWINCKEL), A., i, 617.
- 2-Phenyl-5-methylphenylcarbazine-1-carboxylic and 2-Phenyl-4-methylphenylsemicarbazidecarboxylic acids, ethyl esters (BUSCH), A., i, 616.
- 2-Phenyl-6-methylpiperidines, stereo-isomeric, and their additive compounds; and resolution of, into the active components (SCHOLTZ and MÜLLER), A., i, 41.
- α -Phenyl- β -methylpropane (BODROUX), A., i, 523.
- β -Phenyl- α -methyl- α -propanetricarboxylic acid (CARTER and LAWRENCE), P., 1900, 179.
- α -Phenyl- β -methyl- α -propylene and its dibromide (GRIGNARD), A., i, 681.
- 1-Phenyl-4-methyl-3-propyl-5-pyrazolone (BONGERT), A., i, 654.
- 1-Phenyl-3-methylpyrazole methochloride, 5-chloro-, action of aniline and of ammonia on (MICHAELIS and GUNKEL), A., i, 351.
- 1-Phenyl-3-methylpyrazole-4-carboxylic acid, chloride, and amide, 5-chloro- (MICHAELIS, VOSS, and GREISS), A., i, 408.
- Phenylmethylpyrazoledicarboxylic acids (BÜLOW), A., i, 98.
- 1-Phenyl-5-methylpyrazoline and its salts (TRENER), A., i, 232.
- 1-Phenyl-3-methylpyrazolone (BONGERT), A., i, 409.
- 1-Phenyl-5-methylpyridazone and its 3-carboxylic acid (WOLFF and HEROLD), A., i, 503.

- 5-Phenyl-2-methylpyrrole, 3-nitroso-, and its phenylcarbimide (ANGELICO and CALVELLO), A., i, 747.
- 9-Phenyl-10-methylisorosinduline and its salts (FISCHER and BRUHN), A., i, 417.
- Phenylmethylsemicarbazide-1-carboxylic acids, 2:4- and 4:2-, ethyl esters (BUSCH and HEINRICH), A., i, 617.
- α -Phenyl- γ -methyl- $\alpha\gamma$ -tetradiene (GRIGNARD), A., i, 681.
- Phenylmethylthiodiazoline, imino-, and its acetyl derivative and platinichloride (YOUNG and EYRE), T., 58; P., 1900, 188.
- 2-Phenyl-1-methyltriazole (YOUNG and OATES), T., 668; P., 1901, 86.
- Phenylmethyluracil, and bromo-, and thion- (BEHREND, MEYER, and BUCHHOLZ), A., i, 137.
- Phenylmethylurazoles, 1:4- and 4:1-, and the sodium salt and acetyl derivative of the 1:4-compound (BUSCH and HEINRICH), A., i, 617.
- Phenylmorpholine, dinitro- and nitroso- (MARCKWALD and CHAIN), A., i, 741.
- Phenyl-naphtha- and -isonaphtha-phenazonium, amino-derivatives, relation between colour and constitution of (KEHRMANN), A., i, 52.
- 7-Phenyl-naphthaphenazonium salts, 9-chloro-5-amino-*p*-amino- (KEHRMANN and KRAZLER), A., i, 420.
- 7-Phenyl-naphthaphenazonium, 3-amino- (*isorosinduline* No. 13), and its acetyl derivative and salts (KEHRMANN and SILBERSTEIN), A., i, 103.
- 4-amino- (*isorosinduline* No. 9) (KEHRMANN and STEINER), A., i, 101.
- Phenyl-naphthaphenazonium bromide, 3'-amino-. See *isorosinduline*, fifteenth isomeride.
- 4'-amino-. See *isorosinduline*, fourteenth isomeride.
- Phenyl- $\alpha\beta$ -naphthaphenazonium chloride, 5:3'-diamino-, and its acetyl derivatives and salts (KEHRMANN and NÜESCH), A., i, 767.
- 5:4-diamino- (KEHRMANN and OTT), A., i, 767.
- 12-Phenylisonaphthaphenazonium, 4-amino- (*isorosinduline* No. 12), and its acetyl derivative and its salts (KEHRMANN and STEINER), A., i, 101.
- 12-nitrate, 10-chloro-, and its reactions (KEHRMANN and HIBY), A., i, 418.
- 2-Phenyl- α -naphthiminazole and its salts and benzoyl derivative (FISCHER, FEZER, and REINDL), A., i, 414.
- Phenyl-naphthionic acid (WITT and SCHNEIDER), A., i, 699.
- Phenyl- α - and - β -naphthylamine-6-carboxylic acids, 2:4-dinitro-, and their salts, and acetyl and benzoyl derivatives (COHN), A., i, 642.
- Phenyl- α -naphthylcarbamide, formation of (DIXON), T., 105; P., 1900, 208.
- Phenyl- α - and - β -naphthylcarbazoles, and the nitroso-, acetyl, and benzoyl derivatives of the α -compound (JAPP and MAITLAND), P., 1901, 176.
- 4-Phenyl-1- α -naphthylthiotriazolone-thiol and its methyl ether (BUSCH and WOLPERT), A., i, 234.
- 1-Phenyl-4-*p*-nitrobenzeneazo-5-pyrazolone-3-acetic acid and its ethyl ester (BÜLOW and HÖFFNER), A., i, 240.
- Phenyl-nitroformaldehyde-phenylhydrazone, and -*p*-nitrophenylhydrazone (BAMBERGER and SCHMIDT), A., i, 565; (BAMBERGER and GROB), A., i, 567.
- Phenyl-nitroformaldehyde-phenylhydrazone, action of sodium methoxide on (BAMBERGER and GROB), A., i, 296.
- Phenyl-dinitronaphthylamine (SCHEID), A., i, 521.
- β -Phenyl- α -*m*-nitrophenyl- γ -benzyl-hydroxyamidine and its salts (LEY), A., i, 760.
- Phenyl-nitrosohydrazinesulphonic acid, potassium salt (VOSWINCKEL), A., i, 618.
- Phenyl-nitrotolylsemithiocarbazide (POPE and HIRD), T., 1143; P., 1901, 186.
- Phenyl-*p*-nitro-*o*-tolylsulphonic acid and its sulphonic acid (NORRIS), A., i, 134.
- Phenyl-1:3-oxazine (WOHL and WOHLBERG), A., i, 514.
- 5-Phenyl-3-isooxazolone, benzoyl derivative (PICKARD and NEVILLE), T., 848; P., 1901, 127.
- Phenyloxyacrylic acid (*phenylethylene-oxidecarboxylic acid*), partial conversion of, into phenylpyruvic acid (ERLENMEYER), A., i, 32.
- 3-Phenylcyclopentanone-4-carboxylic acid and its silver salt and semicarbazide (STOBBE and FISCHER), A., i, 277.
- 3-Phenylcyclopentanonedicarboxylic acid and its salts, methyl ester, and semicarbazone (STOBBE and FISCHER), A., i, 276.
- Phenylphenanthrarosinduline (KEHRMANN and EICHLER), A., i, 421.
- 9-Phenylphenanthroline (9-phenyl-4:10-quinquinoline) and its 5-amino- and 5-nitro-, and its sulphonic acid (WILLGERODT and V. NEANDER), A., i, 51.

- 3-Phenyl- ψ -phenanthroline** (*3-phenyl-4:7-quinolinoline*) and its salts, and 6-amino- and 6-nitro- (WILLGERODT and JABLONSKI), A., i, 50.
- 3-Phenyl- ψ -phenanthroline-2-carboxylic acid**, its salts, esters, and 6-amino- and 6-nitro- (WILLGERODT and JABLONSKI), A., i, 50.
- 9-Phenylphenanthroline-7-carboxylic acid**, and its salts, esters, and 5-bromo-, 5-chloro-, and 5-nitro-derivatives and sulphonic acid (WILLGERODT and V. NEANDER), A., i, 51.
- 3-Phenyl- ψ -phenanthroline 6-sulphonic acid** (WILLGERODT and JABLONSKI), A., i, 50.
- Phenylphenotriazone**, 3-*m*- and 3-*p*-nitro- (MEHNER), A., i, 472.
- Phenyl-*p*-phenylenediamine**, *o*- and *p*-nitro- and their acetyl derivatives and hydrochlorides (BANDROWSKI), A., i, 48.
- 1-Phenyl-3-phenylquinolineazone-*p*-carboxylic acid**. See 7-Phenylbenzotriazin-8-one-5-*p*-benzoic acid.
- Phenyl-2-picolylalkine**. See β -Hydroxy- β -phenyl-2-ethylpyridine.
- α -Phenylpropane- $\alpha\beta\gamma$ -tricarballic acid** (STORBE and FISCHER), A., i, 277.
- Phenylpropargyl alcohol** and its acetyl derivative (MOUREU and DESMOTS), A., i, 443.
- Phenylpropionic acid**, ethyl ester, action of, on thymol (RUHEMANN), T., 918; P., 1901, 155.
action of, on the sodium derivative of *m*-xylenol (RUHEMANN and WRAGG), T., 1187; P., 1901, 187.
- Phenylpropionic acid**, amino-, conversion of, into kynurenic acid (CAMPS), A., i, 751.
- Phenyl-*n*- and -*iso*-propylcarbinols** and their acetates (GRIGNARD), A., i, 679.
- Phenylpropylpyrazolone** (BONGERT), A., i, 409.
- 3-Phenylpurine**, 2:5-dichloro-7-amino-, and its isomeride and chlorodiamino- (FOURNEAU), A., i, 238.
- 1-Phenylpyrazole-4-carboxylic acid**, methyl and ethyl esters (WISLICENUS and BINDEMANN), A., i, 362.
- 5-Phenyl-pyrazole- and -pyrazoline-4-carboxylic acids**, methyl esters (V. PECHMANN and BURKARD), A., i, 167.
- 1-Phenyl-5-pyrazolone-3-*p*-nitrobenzeneazetic acid**, and its ethyl ester (BÜLOW and HÖPFNER), A., i, 241.
- Phenylpyridine**, α -dinitro-, chloride, action of alkalis on (SPIEGEL and KATZENELLENBOGEN), A., i, 752.
- Phenylpyrid-*o*-oxazinone-*p*-carboxylic acid**. See Pyridoxazinone-*p*-benzoic acid.
- 3-Phenylpyridylketone-*p*-carboxylic acid** and its salts (FULDA), A., i, 226.
- β -5-Phenylpyrrylpropionic acid** (KEHRER), A., i, 389.
- Phenylpyruvic acid** from phenyloxy-acrylic acid (ERLENMEYER), A., i, 32.
- Phenylquinoline**, 2:3-diamino-, hydrochloride of (FREUND), A., i, 690.
- 3-Phenyl-4:7-quinolinoline**. See 3-Phenyl- ψ -phenanthroline.
- 9-Phenyl-4:10-quinolinoline**. See 9-Phenylphenanthroline.
- Phenylrosinduline chloride**, 3-amino-, and its acetyl derivative (3-acetyl-amino-5-anilino-7-phenylnaphthaphenazonium chloride) (KEHRMANN and SILBERSTEIN), A., i, 103.
- 10-chloro-** (10-chloro-5-anilino-7-phenylphenazonium 7-chloride) (KEHRMANN and HIBY), A., i, 419.
- 2-Phenyl-6-stilbazole** (2-phenyl-6-styrylpyridine) and its salts, and **2-Phenyl-6-stilbazoline** (DEHNEL), A., i, 165.
- o*-Phenylsulphonebenzoic acid** and its anilide, chloride and salts (CANTER), A., i, 208.
- μ -nitro-**, and its salts and amide (NORRIS), A., i, 134.
- Phenyltetrazole** and its isomeride, and its nitro- and amino-derivatives (FREUND and PARADIES), A., i, 771.
- Phenylthiocarbazine acid**, *o*- and *p*-nitrobenzyl esters (BUSCH), A., i, 430.
- Phenylthiocarbimide** (*phenyl isothiocyanate*), reduction of (GUTHIER), A., i, 528.
- Phenylthiocarbiminoacetic acid**, ethyl ester (FISCHER), A., i, 192.
- Phenylthiadiazole** and amino-, and its acetyl derivative, and hydrochloride (YOUNG and EYRE), T., 58; P., 1900, 188.
- Phenylthiadiazolone-anilthiol**, -thio-methane, and disulphide (BUSCH and WOLPERT), A., i, 234; (BUSCH and HOLZMANN), A., i, 235.
- Phenyl-thiol- and -thion-carbazine acids**, ethyl ester, action of acetic and benzoic thiocyanate and of phenyl-carbimide on (WHEELER and DUSTIN), A., i, 25.
- 3-Phenylthio-uric and - ψ -uric acids** (BOEHRINGER & SONS), A., i, 770.
- Phenyl-*p*-toluinourazoles**, 2:5- and 5:2-, and their acetyl derivatives (BUSCH), A., i, 489.
- Phenyl-*p*-tolylamine**, 3-chloro- and 3-chloro-6-amino- (KEHRMANN and KRAZLER), A., i, 420.

- β -Phenyl- α -o-tolyl- γ -benzylhydroxy-amidine** and its copper salt (LEY), A., i, 760.
- Phenyl-*o*- and -*p*-tolylcarbamides**, formation of (DIXON), T., 102; P., 1900, 208.
- Phenyl-*p*-tolylcarbazide-1-carboxylic acids**, 2:5- and 5:2-, ethyl esters (BUSCH), A., i, 489.
- Phenyltolylglyoxalines**, isomeric, preparation of (KUNCKELL), A., i, 294.
- Phenyl-*p*-tolylphosphine derivatives** (MICHAELIS and SÖCHTIG), A., i, 301.
- Phenyl-*p*-tolylsemicarbazide-1-carboxylic acids**, 2:4- and 4:2-, ethyl esters (BUSCH and HEINRICHS), A., i, 617.
- Phenyl-*o*-tolylsulphone** (CANTER), A., i, 208.
- Phenyl-*p*-tolylthiocarbazide-1-carboxylic acids**, 2:5- and 5:2-, ethyl esters (BUSCH and GROHMANN), A., i, 617.
- 4-Phenyl-1-*p*-tolyl- and 1-Phenyl-4-*p*-tolyl-5-thio-1:2:4-triazolone-3-thiols** and their derivatives (BUSCH and WOLPERT), A., i, 234.
- Phenyl-*p*-tolylurazoles**, 1:4- and 4:1- (BUSCH and HEINRICHS), A., i, 617.
- C*-Phenyltriazole** (YOUNG and OATES), T., 665; P., 1901, 86.
- 1-Phenyl-1:3:4-triazole** and its salts (PELLIZZARI and MASSA), A., i, 488.
- 1-Phenyl-1:2:3-triazole-4:5-dicarboxylic acid** (ZINCKE and PETERMANN), A., i, 106.
- 1-Phenyltriazoline**, 5-imino-, and its salts (PELLIZZARI and RONCAGLIOLI), A., i, 769.
- α -Phenyltricarballic acid**. See α -Phenylpropane- $\alpha\beta\gamma$ -tricarballic acid.
- Phenyltrimethylenylthiocarbamide** (KLINER), A., i, 509.
- Phenyluraminocrotonic acid**, ethyl ester (BEHREND, MEYER, and BUCHHOLZ), A., i, 137.
- 1-Phenylurazole**, 5-thio-, and its 4-amino-derivative (BUSCH and GROHMANN), A., i, 616.
- Phenylurethane**, interaction of, with α -naphthylamine and *o*- and *p*-toluidines (DIXON), T., 102; P., 1900, 207.
- Phenylvaleric acid**, preparation of, and the action of aluminium chloride on its chloride (KIPPING and HUNTER), T., 604; P., 1901, 68.
- γ -Phenylvaleric acid**, dithio-, and its ethyl ester (POSNER and DEINHARDT), A., i, 704.
- 3-Phenylxanthine** (BOEHRINGER & SONS), A., i, 770.
- Philothion** (COSSETTINI), A., i, 438.
- Phloridzin**, action of, on the kidneys (v. KÓSSA), A., ii, 31.
- Phloroglucinol ethers**, influence of the substituting radicle on the tautomerism of (KAUFER), A., i, 207.
- benzyl ethers** (KAUFER), A., i, 206.
- trimethylether** (HERZIG and KASERER), A., i, 206.
- Phloroglucinolcarboxylic acid**, methyl ester, and its acetates (HERZIG and WENZEL), A., i, 473.
- methyl ether** and its methyl ester (HERZIG and WENZEL), A., i, 473.
- Phoenix canariensis***, composition of the albumen of the seeds of (BOURQUELOT and HÉRISSEY), A., ii, 619.
- Phorone**, sulphonal derivatives of (POSNER), A., i, 474.
- Phosgene**. See Carbonyl chloride.
- Phosphates**. See under Phosphorus.
- Phosphine**. See Hydrogen phosphide.
- Phosphines**, chloro-, aromatic, and their derivatives (MICHAELIS), A., i, 300.
- Phosphorescence** in liquid hydrogen (DEWAR), A., ii, 598.
- Phosphorite**, experiments with (ENGELHARDT), A., ii, 276.
- Phosphorus**, space configuration of the valencies of (CAVEN), P., 1901, 26.
- latent heat of vaporisation of** (DE FORCRAND), A., ii, 641.
- temperature of ignition of** (EYDMANN), A., ii, 312.
- amorphous**, composition of (FITTICA), A., ii, 312.
- solubility of**, in aqueous alcoholic potash (BURGESS and CHAPMAN), T., 1243; P., 1901, 190.
- conversion of**, into antimony (FITTICA), A., ii, 59.
- alleged conversion of**, into arsenic (CHRISTOMANOS; FITTICA), A., ii, 59.
- in nucleins** (ASCOLI), A., i, 108.
- excretion of**, during inanition (SCHULZ and MAINZER), A., ii, 407.
- oxygen compounds**, excretion of (GAMBL), A., ii, 610.
- Phosphorus trichloride**, preparation of (GRAEBE), A., ii, 309.
- action of thiocyanate on** (DIXON), T., 545; P., 1901, 50.
- tri-* and *penta-*chlorides**, compounds of, with boron bromide (TARBLE), A., ii, 153.
- action of**, on glycerol diaryl ethers (BOYD), T., 1221; P., 1901, 188.
- Phosphoryl chloride**, preparation of (ULLMANN and FORNARO), A., ii, 551.
- action of lead thiocyanate on** (DIXON), T., 548; P., 1901, 50.

Phosphorus:—

Phosphoryl chloride as a solvent in cryoscopy (ODDO), A., ii, 492.
organic derivatives of (CAVEN), P., 1901, 26.

Phosphorus di- and tri-iodide, action of boron bromide on (TARIBLE), A., ii, 153.

suboxide (MICHAELIS and V. AREND), A., ii, 153; (BESSON), A., ii, 502.
non-existence of (BURGESS and CHAPMAN), T., 1235; P., 1901, 189.

Phosphoric oxide, heat of formation of (DE FORCRAND), A., ii, 641.

Hypophosphorous acid, action of, on acetone (MARIE), A., i, 635.

Phosphorous acid, estimation of, volumetrically (KÜHLING), A., ii, 38.

Phosphoric acid, acidimetry of (BERTHELOT), A., ii, 502, 504, 551; (CAVALIER), A., ii, 502.

influence of diet on the, in urine (MAUREL), A., ii, 565.

role of, in animal life (WRÓBLEWSKI), A., ii, 328.

Kilgore's method for the estimation of (WILLIAMS), A., ii, 344.

estimation of, as ammonium phosphomolybdate (PELLET), A., ii, 575.

estimation of, as phosphomolybdic oxide (SEYDA), A., ii, 689.

estimation of, in presence of much iron oxide (PELLET), A., ii, 477.

estimation of, in ashes, manures, and soils by the direct weighing of the phosphomolybdate precipitate (V. LORENZ), A., ii, 278.

estimation of, in manures (LEDoux), A., ii, 576.

estimation of, in basic slags (PAPEŽ), A., ii, 192.

estimation of, in soils (GULLY), A., ii, 576.

soluble in water, estimation of, in superphosphates (V. SZÉLL), A., ii, 476.

estimation of, in wines (SARTORI; Woy), A., ii, 344.

See also Agricultural Chemistry.

Phosphates from Moravia (V. JOHN), A., ii, 248.

insoluble, formation of, by double decomposition (BERTHELOT), A., ii, 503.

influence of, on the fermentative action of yeast extract (WRÓBLEWSKI), A., ii, 328, 616.

mineral, detection of, in basic slags, bone meal, superphosphates and animal charcoal (V. LORENZ), A., ii, 193.

LXXX. ii.

Phosphorus:—

Metaphosphoric acid, velocity of hydration of (MONTMARTINI and EGIDI), A., ii, 551.

Superphosphates, detection of mineral phosphates in (V. LORENZ), A., ii, 193.

estimation of phosphoric acid soluble in water in (V. SZÉLL), A., ii, 476.

Phosphorus, detection and estimation of:—

detection of, by the Bloudlot-Dusart method, in poisoning cases (HALÁSZ), A., ii, 343.

estimation of, in acetylene and other combustible gases (EITNER and KEPELER), A., ii, 689.

estimation of, in iron and steel (IBBOTSON and BREARLEY), A., ii, 343.

estimation of, in phosphorised oils (STICH), A., ii, 422; (FRÄNKEL), A., ii, 423.

estimation of, in potable waters (WOODMAN and CAYVAN), A., ii, 344; (LEPIERRE), A., ii, 689.

Phosphorus-arsenic-antimony group, replacements in the (KRAFFT and NEUMANN), A., ii, 235.

"**Phosphorus trithiocyanate**," action of aniline and *o*-toluidine on (DIXON), T., 546; P., 1901, 51.

"**Phosphoryl trithiocyanate**," action of aniline, ammonia, and *o*-toluidine on (DIXON), T., 548; P., 1901, 51.

Phosphotungstic acid, compounds of, with ketones (V. BAEYER and VILLIGER), A., i, 660.

Photobacteria, use of, in the investigation of the chlorophyll function (BEYERINCK), A., ii, 523.

PHOTOCHEMISTRY:—

Light, chemical action of (CIAMICIAN and SILBER), A., i, 36, 329, 390, 547.

action of, on the interaction of alcohols with ketones and aldehydes (CIAMICIAN and SILBER), A., i, 329.

action of, on ammonium oxalate (GILLOT), A., i, 119.

action of, on diazo-compounds (RUFF and STEIN), A., i, 619; (GREEN, CROSS, and BEVAN), A., ii, 634.

sensitiveness of fluorescein, its substituted derivatives, and the leuco-bases to (GROS), A., ii, 433.

action of, on the decomposition of hydrogen iodide (PINNOW), A., ii, 634.

PHOTOCHEMISTRY:—

Light, sensitiveness of hydrogen peroxide to, in aqueous solution on addition of ferro- and ferri-cyanide (KISTIAKOWSKY), A., ii, 58.

influence of, on aqueous solutions of potassium ferri-cyanide (MATUSCHEK), A., i, 455, 584, 636, 677.

action of, on aqueous solutions of potassium ferrocyanide (MATUSCHEK), A., i, 635, 636.

action of, on the action of sulphur dioxide on potassium ferro- and ferri-cyanide (MATUSCHEK), A., i, 635.

action of, on silver chloride in presence of hydrogen (JOUNIAUX), A., ii, 506.

influence of the nature and intensity of, on the inversion of sucrose by mineral acids (GILLOT), A., i, 127.

absorption of, new method of testing colourless carbon compounds for (PINNOW), A., ii, 368.

Photochemical effect, influence of the medium on the, in silver bromide emulsions (ABEGG and IMMERWAHR), A., ii, 217.

induction (ABEGG and IMMERWAHR), A., ii, 217.

Photographic action, effect of the temperature of liquid air and hydrogen on (DEWAR), A., ii, 598.

of radio-active lead salts (HOFMANN and STRAUSS), A., ii, 655.

development, theory of (PRECHT; PRECHT and STRECKER), A., ii, 1.

printing, the diazotype process in (RUFF and STEIN), A., i, 619; (GREEN, CROSS, and BEVAN), A., ii, 634.

Radiations from radium, physiological action of (GIESEL), A., ii, 99.

Radioactive lead (HOFMANN and STRAUSS), A., ii, 19, 159, 385, 655.

and rare earths (HOFMANN and STRAUSS), A., ii, 19.

substances (GIESEL), A., ii, 99.

action of cathode rays on (HOFMANN, KORN, and STRAUSS), A., ii, 216.

Radio-activity of salts of radium (CURIE and DEBIERNE), A., ii, 589.

induced by radium salts (BECQUEREL), A., ii, 215; (CURIE and DEBIERNE), A., ii, 216, 298.

PHOTOCHEMISTRY:—

Cathode rays, action of, on radio-active substances (HOFMANN, KORN, and STRAUSS), A., ii, 216.

Röntgen rays, laws of transparency of matter for (BENOIST), A., ii, 215, 216, 308; (HÉBERT and REYNAUD), A., ii, 215.

Polarisation:—

Rotation, influence of a heterocyclic group on (FRANKLAND and ASTON), T., 511; P., 1901, 41.

of optically active compounds, influence of solvents on (PATTERSON), T., 167, 477; P., 1900, 176; 1901, 40.

of active amyl derivatives (GUYE), A., i, 442.

of dextrose, change of the (OSAKA), A., i, 127.

of *l*-dimethoxysuccinic acid and its salts and esters (PURDIE and IRVINE), T., 959; P., 1901, 157.

of ethereal dimethoxysuccinates and tartrates, influence of solvents on (PURDIE and BARBOUR), T., 971; P., 1901, 158.

of dipyromucyltartrac methyl and ethyl esters (FRANKLAND and ASTON), T., 519; P., 1901, 41.

of certain ethers and esters (GUYE), T., 475; P., 1901, 48.

of the amides, anilides, and *o*- and *p*-toluidides of glyceric acid (FRANKLAND, WHARTON, and ASTON), T., 266; P., 1901, 6.

of leicithin (ULFANI), A., i, 491, 498.

of liehen acids (SALKOWSKI), A., i, 152.

of ethyl *n*-acyl-*l*-malates (REITTER), A., ii, 214.

of malates, influence of molybdic acid and molybdates on (ITZIG), A., i, 580.

of sugar, measurement of the, and its variation with temperature and with the wave-length of the light used (PELLAT), A., i, 672.

of tartrates, influence of molybdates and tartrates on (ITZIG), A., i, 448.

of methyl tartrate (PATTERSON and DICKINSON), T., 283; P., 1901, 4.

of ethyl *sec*-octyl tartrate and its dibenzoyl and diacetyl derivatives (MCCRAE), T., 1106; P., 1901, 186.

Rotation dispersion of malic acid (WORINGER), A., ii, 214.

PHOTOCHEMISTRY:—

Magnetic rotation in liquefied gases under atmospheric pressure, apparatus to determine (SIERTSEMA), A., ii, 5.

of ring compounds yielding vapours which are rendered luminous by exposure to Tesla rays (KAUFFMANN), A., i, 318.

of tetramethylenecarbinol (PERKIN), T., 331; P., 1901, 33.

Multitrotation of the phenylhydrazones of dextrose (SIMON and BÉNARD), A., i, 257.

Refraction, determination of, as a method for the investigation of the composition of co-existing liquid and vapour phases (CUNAEUS), A., ii, 213.

of argon, helium, krypton, neon, and xenon (RAMSAY), A., ii, 141.

of bromine (RIVIÈRE), A., ii, 1.

of liquid hydrogen (DEWAR), A., ii, 597.

of solutions of calcium chloride (BREMER), A., ii, 141.

of tellurium in its compounds (PELLINI and MENIN), A., ii, 94.

of hydro-derivatives of cyclic chains (PELLINI), A., ii, 365.

of mixtures of liquids (DE KOWALSKI), A., ii, 537.

of aqueous carbohydrate solutions (STOLLE), A., i, 368, 507.

of chloral hydrate in solution (RUDOLPHI), A., ii, 489.

of colloid piperine (MADAN), T., 925; P., 1901, 127.

of tetramethylenecarbinol (PERKIN), T., 331; P., 1901, 33.

of uranium sulphate (OECHSNER DE CONINCK), A., ii, 660.

Dispersion of bromine (RIVIÈRE), A., ii, 1.

of cyclic chains and their hydro-derivatives (PELLINI), A., ii, 365.

of colloid piperine (MADAN), T., 926; P., 1901, 127.

Spectrum, Swan (SMITHIELLS), A., ii, 366; (BALY and SYERS), A., ii, 633.

Spectra, absorption, and chemical constitution of saline solutions, action of heat on (HARTLEY), A., ii, 53.

of flames from operations in the open hearth and basic Bessemer processes (HARTLEY and RAMAGE), A., ii, 366.

infra-red, of the alkalis and alkaline earths (LEHMANN), A., ii, 142.

PHOTOCHEMISTRY:—

Spectra, arc, of some metals as influenced by an atmosphere of hydrogen (CREW), A., ii, 81.

of the gases of the atmosphere (RAYLEIGH), A., ii, 141.

of the more volatile atmospheric gases, which are not condensed at the temperature of liquid hydrogen (LIVEING and DEWAR), A., ii, 213.

of argon, krypton, and xenon (LIVEING and DEWAR), A., ii, 598.

of alumina and nitrogen (BERNDT), A., ii, 367.

band, of nitrogen in oscillatory spark (HEMSALECH), A., ii, 433.

of carbon (LEHMANN), A., ii, 142.

of cyanogen (BALY and SYERS), A., ii, 633.

luminescence, of the rare earths (BAUR and MARC), A., ii, 634.

of gadolinium and samarium (DEMARÇAY), A., ii, 102.

of hydrogen and some of its compounds (TROWBRIDGE), A., ii, 633.

of solutions of iodides (HAGENBACH), A., ii, 434.

of silicon (HARTLEY), A., ii, 367.

arc, of vanadium (LOCKYER and BAXANDALL), A., ii, 489.

of carbon compounds (SMITHIELLS), A., ii, 366; (BALY and SYERS), A., ii, 633.

of cyanogen compounds (HARTLEY, DOBBIE, and LAUDER), T., 848; T., 1901, 125.

of bromoanilic and chloroanilic acids and their alkali salts (FIORINI), A., ii, 367.

of indophenols (LEMOULT), A., i, 232; (BAYRAC and CAMICHEL), A., i, 296; (CAMICHEL and BAYRAC), A., i, 296; ii, 297.

of methylfurfuraldehyde (OSHIMA and TOLLENS), A., ii, 484.

of the azo-dyes from β -naphthol and α -naphthylaminesulphonic acids (VALENTA), A., i, 239.

of phenylnaphthaphenazonium salts (KEHRMANN and NÜESCH), A., i, 767.

of dyes from triphenylmethane (CAMICHEL and BAYRAC), A., i, 296.

of triphenylmethane colouring matters in relation to their chemical constitution (LEMOULT; CAMICHEL), A., i, 100.

of the colouring matter of beetroot (FORMÁNEK), A., ii, 35.

PHOTOCHEMISTRY:—

- Spectra** of the yellow colouring matters accompanying chlorophyll (SCHUNCK), A., i, 734.
 of blood in presence of formaldehyde (TOLLENS), A., i, 492.
 of the colouring matters of blood (FORMÁNEK), A., ii, 711.
 lamps for (BECKMANN), A., ii, 53, 81.
- Spectrographic analysis** of minerals, simple method for the (HARTLEY and RAMAGE), T., 61; P., 1900, 191.
 sensitiveness of the reactions based on (SCHULER), A., ii, 633.
 rapid, of gases, practical methods for the (BERTHELOT), A., ii, 684.
- Photography.** See Photochemistry.
- Phthalaldehydic acid** benzoylhydrazine and N-phenyloxime (BISTRZYCKI and HERBST), A., i, 387.
- Phthalazonecarboxylic acid**, its ammonium salt, ethyl ester, and chloride (FRÄNKEL), A., i, 44.
- Phthalic acid**, 2:4-diiodophenyl ester (BRENANS), A., i, 643.
 methyl ethyl ester and methyl chloride (MEYER), A., i, 750.
- Phthalic acid**, 4:5-dibromo-, and its esters (BRÜCK), A., i, 719.
 dichloro-, Le Royer's (SEVERIN), A., i, 389.
 3:4:6-trichloro- (GRAEBE and ROSTOWZEW), A., i, 543.
 diiodo- (EDINGER and GOLDBERG), A., i, 23.
 3-nitro-, preparation and esterification of (MCKENZIE), T., 1135; P., 1901, 186.
 esterification of (WEGSCHEIDER and LIPSCHITZ), A., i, 32; (WEGSCHEIDER), A., i, 325.
 active- and iso-amyl esters (MARKWALD and MCKENZIE), A., i, 249.
- 4-nitro-, esterification of (WEGSCHEIDER and LIPSCHITZ), A., i, 32.
- Phthalic acid peroxide** and its ethyl ester (V. BAEYER and VILLIGER), A., i, 326.
- Perphthalic acid** (V. BAEYER and VILLIGER), A., i, 326.
- isoPhthalic acid**, diiodo- (EDINGER and GOLDBERG), A., i, 22.
- Phthalic anhydride**, 3:4-dichloro-, and its imide and phenylimide (FERRAND), A., i, 637.
 3:4:6-trichloro- (GRAEBE and ROSTOWZEW), A., i, 543.
 3-nitro-, preparation of (MCKENZIE), T., 1137.

- Phthalic chloride**, action of, on quin-aldine (EISNER and LANGE), A., i, 348.
- Phthalide**, 4:5-dibromo- (BRÜCK), A., i, 720.
- Phthalimide**, 3:4:6-trichloro- (GRAEBE and ROSTOWZEW), A., i, 543.
 4-nitro- (FRÄNKEL), A., i, 44.
- Phthalimidine**, 4:5-dibromo-, and its nitroso-derivative (BRÜCK), A., i, 719.
- δ -Phthalimino- α -bromovaleric acid** (FISCHER), A., i, 191.
- γ -Phthaliminobutyric acid**, α -bromo- and α -amino- (FISCHER), A., i, 675.
- β -Phthaliminoethylbromomalononic acid**, ethyl ester (FISCHER), A., i, 674.
- γ -Phthaliminopropylbromomalononic acid**, and its ethyl ester (FISCHER), A., i, 191.
- β -Phthaloylglutaric acid** and its salts and ketodilactone (FITTIG and GOTTSCHKE), A., i, 122.
- Phyllocyanin**, reduction of, to hæmopyrrole (NENCKI and MARCHLEWSKI), A., i, 554.
- Physico-chemical processes**, law of (LEWIS), A., ii, 10, 639.
- Physiological action**, relationship between, chemical constitution, and chemical change in the organism (HILDEBRANDT), A., ii, 614.
 relation between chemical constitution and, in the piperidine series (R. and E. WOLFFENSTEIN), A., ii, 566.
 of aconitine, pseudaconitine and japaconitine (CASH and DUNSTAN), A., ii, 613.
 of pyraconitine and of methylbenzaconitine in relation to their constitution (CASH and DUNSTAN), A., ii, 612.
 of the three arabinoses (SALKOWSKI; NEUBERG and WOHLGEMUTH), A., ii, 521.
 of aspirin (SINGER), A., ii, 408.
 of cacodylic acid (HEFFTER), A., ii, 464.
 of carbostyryl and kynurin (V. FENYVESSY), A., ii, 31.
 of carone (RIMINI), A., ii, 522.
 of cereic acid, pectenine, and pilocericine (HEYL), A., i, 738.
 of chloroform and ether (WRIGHT), A., ii, 180, 408.
 of coriamyrtin and tutin (EASTFIELD and ASTON), T., 124; P., 1900, 212.
 of some cyanopyridone derivatives (DERIU), A., ii, 323.
 of drugs (NOËL-PATON and EASON), A., ii, 253.
 of epinephrine sulphate (HUNT), A., ii, 259.

- Physiological action** of three poisonous fungi (CARTER), A., ii, 409.
 of glaucine (SCHMIDT), A., i, 742.
 of *d*-gluconic acid (MAYER), A., ii, 261.
 of glycerol (LYLE), A., ii, 181.
 of guanylic acid (BANG), A., ii, 408.
 of melanoidin and spongio-melanoidin (ROSENFELD), A., ii, 180.
 of mucus (CHARRIN and MOUSSU), A., ii, 180.
 of extracts of nervous tissues (HALLIBURTON), A., ii, 181.
 of nicotine (LANGLEY), A., ii, 671.
 of nitrophenols (FIQUET), A., i, 469.
 of aromatic nitro-compounds (WALKO), A., ii, 669.
 of orchitic extracts (DIXON), A., ii, 259.
 of phenacylphenacetin and triphenylguanidine guaiacolsulphonate (GOLD-SCHMIDT), A., i, 643.
 of 1-phenyl-1:3:4-triazole (PELLIZZARI and MASSA), A., i, 488.
 of protoplasmic poisons (ROSTOSKI), A., ii, 261.
 of some purine derivatives (SCHMIEDEBERG), A., ii, 674.
 of pyrimidine compounds (STEUDEL), A., ii, 409.
 of radium rays (GIESEL), A., ii, 99.
 of pure sodium chloride solutions (CUSHING), A., ii, 671.
 of strychnine (HARE), A., ii, 522.
 of suprarenal extracts (HUNT), A., ii, 259; (LANGLEY), A., ii, 673.
 of tellurium compounds (MEAD and GIES), A., ii, 261.
 of substances from the thyroid (v. UYON and OSWALD), A., ii, 180.
- Phytolacca**, detection of, in wine (BELLIER), A., ii, 210.
Picea vulgaris, balsam of (TSCHIRCH and BRÜNING), A., i, 91.
- Piceapimaric, Piceapimarinic, and Piceapimarolic acids** (TSCHIRCH and BRÜNING), A., i, 91.
- Picoline**, compounds of, with metallic salts (TOMBECK), A., i, 164, 267.
- α -Picoline** from Scottish shale oil (GARRETT and SMYTHE), P., 1900, 190.
 specific heat and latent heat of evaporation of (KAHLENBERG), A., ii, 492.
 action of, on substituted aromatic aldehydes (ROTH), A., i, 165; (BACKE), A., i, 562.
- 3-Picoline**, action of bromine on (DENNEL), A., i, 164.
- Picolinic chloride** (MEYER), A., i, 407.
- 3-Picolylalkaline**. See 3-Hydroxymethylpyridine.
- Picramide**, additive compounds of, with α - and β -naphthylamine (SUDBOROUGH), T., 532; P., 1901, 41.
- Picric acid** (2:4:6-trinitrophenol), thallium salt, physical isomerism of (RABE), A., i, 697.
 methyl and ethyl esters, additive compounds of, with α -naphthylamine (SUDBOROUGH), T., 532; P., 1901, 44.
- isoPicric acid** and its potassium salt (NIETZKI and DIETSCHY), A., i, 197.
- Picrylphenylthylideneoxycyclotriazan** (VOSWINCKEL), A., i, 54.
- Pigment**, $C_{16}H_{18}O_2N_1$, orange, from *Uraster rubens* (GRIFFITHS and WARREN), A., i, 94.
- Pigments**, solubility of, in fats and soaps (NERKING), A., ii, 117.
- Pigs**. See Agricultural Chemistry.
- Pilocarpine**, constitution of, and its dibromo-derivative (JOWETT), T., 580, 1331; P., 1901, 56, 198.
 oxidation of (PINNER and KOHLHAMMER), A., i, 340.
- isoPilocarpine**, action of bromine, and various reagents on, and its oxidation (JOWETT), T., 582, 1333; P., 1901, 56, 198.
mono- and *di*-bromo-, and the reduction and oxidation of the dibromo-derivative (JOWETT), T., 583; P., 1901, 56.
- isoPilocarpinic acid** and *mono*- and *di*-bromo-, and the action of reducing agents on the bromine derivatives (JOWETT), T., 583; P., 1901, 56.
- isoPilocarpinolactone** (JOWETT), T., 594; P., 1901, 56.
- Pilocereine** and its aurichloride and platinumchloride (HEYL), A., i, 733.
- Pilopic acid**, and its constitution, methyl ester, anilide barium and acid strychnine salts (JOWETT), T., 580, 1335; P., 1901, 56, 198.
- Pilopinic acid** and its ethyl ester (JOWETT), T., 585; P., 1901, 56.
- Piluvic acid**, $C_8H_{12}O_5$, and its esters (PINNER and KOHLHAMMER), A., i, 340.
- Pimaric, Pimarinic, and α - and β -Pimarolic acids** (TSCHIRCH and BRÜNING), A., i, 220.
- i*-Pimaric acid** from sandarac resin, and its salts, and ethyl ester (HENRY), T., 1151; P., 1901, 187.
- n*-Pimelic acid** and the preparation and electrolysis of its ethyl potassium salt (WALKER and LUMSDEN), T., 1198; P., 1901, 188.
- Pinacone**, $C_{18}H_{30}O_2$, from the reduction of *Dd*-fenchocamphorone (WALLACH and NEUMANN), A., i, 333.

- d*-Pinene from *Alpinia malaccensis* (VAN ROMBURGH), A., i, 219; (SCHIMMEL & Co.), A., i, 394.
from sandarac resin (HENRY), T., 1150; P., 1901, 187.
- Pine trees. See Agricultural Chemistry.
- Pinocampholenic acid and its nitrile, and Pinocamphylamine and its acetyl and carbamide derivatives (WALLACH and ROJAHN), A., i, 90.
- Pinoresinol, dry distillation of (BAMBERGER and VISCHNER), A., i, 220.
- Pinus Pinaster*, the resin-balsam of (TSCHIRCH and BRÜNING), A., i, 220.
- Pinus sylvestris*, resin of (TSCHIRCH and NIEDERSTADT), A., i, 397.
- 1-Pipecolinic acid (1-piperidine-2-carboxylic acid), and its hydrochloride and salts (WILLSTÄTTER), A., i, 739.
- Piperidine, action of, on β -chloroallylthiocarbimide (DIXON), T., 559; P., 1901, 49.
action of amidosulphuric acid on (PAAL and HUBALECK), A., i, 745.
action of nitrohydroxylaminic acid on (ANGELI), A., i, 57.
- 2:6-Piperidinedicarboxylic acids, α - and β -, and their amides, hydrobromides, and salts, synthesis of (FISCHER), A., i, 746.
- Piperidine series, stereochemistry in the (HOHENEMSER and WOLFFENSTEIN), A., i, 606; (MARUSE and WOLFFENSTEIN), A., i, 608; (GROSCHUFF), A., i, 745.
relation between chemical constitution and physiological action in the (R. and E. WOLFFENSTEIN), A., ii, 566.
determination of the dielectric constants of substances of the (LADENBURG), A., ii, 634.
- Piperidine-1- and -C-sulphonic acids, and their salts (PAAL and HUBALECK), A., i, 745.
- 11-Piperidino- α -naphthaquinone-3-malonic acid, ethyl ester (LIEBERMANN and LANSER), A., i, 467.
- Piperidylcyclopentene and its salts (NOELDECHEN), A., i, 61.
- Piperine, the colloid form of, and its dispersive and refractive powers (MADAN), T., 922; P., 1901, 127.
- Piperonalhydroxamic acid and bromo- (ANGELICO and FANARA), A., i, 708.
copper salt (RIMINI), A., i, 451.
- Piperonylacetylene (FEUERSTEIN and HEIMANN), A., i, 465.
- Piperonylacrylic acid, its methyl and ethyl esters and dibromide (FEUERSTEIN and HEIMANN), A., i, 465.
- Piperonylamide (RUPE and v. MAJEW-SKI), A., i, 103.
- Pipette, a calibrating mercury (BELL), P., 1901, 179.
- Piscidic acid, and its hydrogen ethyl ester, dianilide, and diacetyl derivative, and the action of bromine on (FREER and CLOVER), A., ii, 333.
- Pitches, quantitative reactions to distinguish (HOLDE and MARCUSSEN), A., ii, 76.
- Pittakal (LIEBERMANN), A., i, 384.
- Pituitary extract, action of, on the kidney (MAGNUS and SCHÄFER), A., ii, 612.
- Plants, estimation of cellulose in (HOFFMEISTER), A., ii, 205.
See also Agricultural Chemistry.
- Plaster of Paris from the kilns, estimation of unburnt and overburnt gypsum in the (PÉRIN), A., ii, 129.
- Platinum, recovery of, from platinum residues (BERTHOLD), A., ii, 557.
presence of, among the characters of a hieroglyphic inscription (BERTHELOT), A., ii, 318.
colloidal, catalytic action of, on gas cells (HÖBER), A., ii, 151.
catalysis of electrolytic gas by (ERNST), A., ii, 495.
catalytic action of, as affected by poisons (BREDIG and IKEDA), A., ii, 441; (RAUDNITZ), A., ii, 496; (BREDIG), A., ii, 596.
action of ammonia on, at high temperatures (BELBY and HENDERSON), T., 1253; P., 1901, 190.
- Platinum alloy on an Egyptian sheath (BERTHELOT), A., ii, 515.
with aluminium (BRUNCK), A., ii, 656.
- Platinum salts, complex (MIOLATI and BELLUCCI), A., ii, 246.
- Platinum tetrachloride, formation of (MALLET), A., ii, 454.
- Chloroplatinic acid, action of chloroform and of mesityl oxide on (PRANDTL and HOFMANN), A., i, 13.
compounds of, with aldehydes and ketones (v. BAeyer and VILLIGER), A., i, 659.
- Platinum organic compounds:—
- Platinum bases, constitution of (WERNER and HERTZ), A., ii, 638.
- Platinum salts, complex (VÉZES), A., i, 187; (MIOLATI and BELLUCCI), A., ii, 246.
compounds of, with pyridine and with ethylenediamine (JØRGENSEN), A., i, 163.

- Platinum indium cyanide** (RENZ), A., ii, 657.
- Platinum**, estimation of, in platinum ores (LEIDIE and QUENNESSEN), A., ii, 695.
- Platinum metals**, method for the separation of the (LEIDIE), A., ii, 62.
- Pleonaste** from Unter-Lhota, Moravia (KOVÁŘ), A., ii, 606.
- Pleurococcus vulgaris* from the bark of lime trees (BRÄUTIGAM), A., i, 93.
- Plicatic acid** from lichens (HESSE), A., i, 149.
- Poison**, volatile, from the skin of *Iulus terrestris* (PHISALIX; BÉHAL and PHISALIX), A., ii, 69.
- Poisons**, inorganic, method for the destruction of organic matter applicable to the detection of (DENIGES), A., ii, 690.
- Poisoning**, recognition of barium compounds as the cause of (VITALI), A., ii, 39.
- by carbon monoxide, treatment of, by oxygen (GRÉHANT), A., ii, 409.
- by hydrocyanic acid, antidote for (HERTING), A., ii, 535.
- detection of phosphorus by the Blondlot-Dusart method in cases of (HALÁSZ), A., ii, 343.
- acid, in birds (MILROV), A., ii, 611.
- Poisonous effects** of alkali solutions (MOORE), A., ii, 68.
- Polarisation**. See Electrochemistry and Photochemistry.
- Polycystin** from *Polycystis flos aque* (ZOPF), A., i, 283.
- Polygonum tinctorium*, organic iron compounds in (SUZUKI), A., ii, 678.
- Polyhalite**, artificial preparation of (BASCH), A., ii, 168.
- Polyhaloid compounds**, abnormal behaviour of, with alcoholic potash (KONDAKOFF), A., i, 62, 305, 625.
- Polyiodides**, nature of, and their dissociation in aqueous solution (DAWSON), T., 238; P., 1900, 215.
- Polymerisation** of organic liquids (GUYE and BAUD), A., ii, 437, 543.
- Polysulphides**, organic (BLANKSMA), A., i, 264.
- Polygonium rosalbum*, camphor excreted by (COOK), A., ii, 179.
- Porphyrexide**, constitution of, and mono- and di-chloro-, and their salts (PILOTY and SCHWERIN), A., i, 517, 583.
- Porphyrexine** and its salts (PILOTY and SCHWERIN), A., i, 517.
- Potassammonium**, action of, on certain metalloids (HUGOT), A., ii, 18.
- Potassium salts**, combination of, with ammonia in aqueous solution (DAWSON and McCRAE), T., 498; P., 1901, 6.
- toxic action of, on plants (COUPIN), A., ii, 122, 525.
- See also Agricultural Chemistry.
- Potassium copper antimonate** (DELA-CROIX), A., ii, 316.
- bromide, synthesis of; lecture experiment (ROSENFELD), A., ii, 547.
- carbonate, absorption of water vapour by (BUSNIKOFF), A., ii, 59.
- copper carbonate (GRÖGER), A., ii, 240.
- chlorate, the supposed mechanical facilitation of the decomposition of (SODEAU), T., 939; P., 1901, 149.
- chloride and nitrate, degree of dissociation in mixed solutions of (SACKUR), A., ii, 636.
- and magnesium chloride and sulphates, maximum vapour pressure of solutions of, at 25° (VAN'T HOFF and V. EULER-CHELPIN), A., ii, 249.
- influence of cane sugar on the conductivity of solutions of (MARTIN and MASSON), T., 707; P., 1901, 91.
- double salt of, with antimony pentachloride (WEINLAND and SCHLEGELMILCH), A., ii, 660.
- compound of, with uranyl chloride (ALOY), A., ii, 164.
- molybdenylchloride (NORDENSKJÖLD), A., ii, 454.
- hydroxide and its hydrates, thermal study of (DE FORCRAND), A., ii, 593.
- influence of cane sugar on the conductivity of solutions of (MARTIN and MASSON), T., 707; P., 1901, 91.
- reaction between chloroform and (SAUNDERS), A., ii, 13.
- iodide, double salts of, with mercuric iodide (PAWLOFF), A., ii, 101.
- triiodide, nature of (DAWSON), T., 238; P., 1900, 215.
- manganate, preparation of (KASSNER and KELLER), A., ii, 657.
- permanganate, preparation of, by means of ozone (FARBENFABRIKEN VORM. F. BAYER & Co.), A., ii, 658.
- action of heat on (RUDORF), A., ii, 388.
- action of, on alkali thiosulphates in neutral solutions (DOBBIN), A., ii, 311.

- Potassium nitrate** and chloride, degree of dissociation in mixed solutions of (SACKUR), A., ii, 636.
 absorption of water vapour by (BUSNIKOFF), A., ii, 59.
 compound of, with tetraethyl-diacetylic acid (BIGINELLI), A., i, 21.
 estimation of nitrogen in (BÖTCHER), A., ii, 124; (V. WISSELL), A., ii, 125.
 See also *Agricultural Chemistry*.
aminochlorosmate and its hydrochloride (BRIZARD), A., ii, 108; (WERNER and DINKLAGE), A., ii, 661.
nitrilopentachloro-osmate (WERNER and DINKLAGE), A., ii, 661.
telluriphosphates (WEINLAND and PRAUSE), A., ii, 600.
perselenate (DENNIS and BROWN), A., ii, 501.
sulphate, transport numbers for (NOYES), A., ii, 144.
 double salt with plumbic sulphate (ELBS and FISCHER), A., ii, 100.
 magnesium hydrogen sulphate $\text{KMg}(\text{SO}_4)_2 + 2\text{H}_2\text{O}$ (MEYERHOFER and COTTRELL), A., ii, 552.
rhodium alum (PICCINI and MARINO), A., ii, 392.
persulphate, action of anhydrous sulphuric acid on (BACH), A., ii, 447.
imidodisulphite (DIVERS and OGAWA), T., 1101; P., 1901, 164.
 and potassium sodium nitrosulphates (DIVERS and HAGA), T., 1096; P., 1901, 164.

Potassium organic compounds:—

- ammonium cyanide** (HERTING), A., ii, 535.
ferrocyanide, influence of light on the decomposition of (MATUSCHEK), A., i, 455, 584, 636, 677.
 action of carbon dioxide on aqueous solutions of (MATUSCHEK), A., i, 677.
 action of hydrofluosilicic acid on (MATUSCHEK), A., i, 454.
 action of sulphur dioxide on aqueous solutions of (MATUSCHEK), A., i, 635.
ferrocyanide, action of sunlight on (MATUSCHEK), A., i, 635, 636.
 action of carbon dioxide on aqueous solutions of (MATUSCHEK), A., i, 677.
 action of hydrofluosilicic acid on (MATUSCHEK), A., i, 262.
 action of sodium sulphide on (BERTHELOT), A., i, 20.

Potassium organic compounds:—

- ferrocyanide**, action of sulphur dioxide on aqueous solutions of (MATUSCHEK), A., i, 635.
barium platoso-oxalonitrite (VÉZES), A., i, 187.
aryl sulphates (VERLEY), A., i, 143.
thiocyanate in nasal and conjunctival secretion (MUCK), A., ii, 117.
 variation of the quantity of, in human saliva (GROBER), A., ii, 402; (SCHNEIDER), A., ii, 459.
 action of heat on (GILES), A., i, 262.
 as indicator in the reduction of ferric salts (EBELING), A., ii, 424; (VOLHARD), A., ii, 580; (DE KONINCK), A., ii, 694.
Potassium, estimation of:—
 detection of, by sodium picrate (REICHARD), A., ii, 577.
 estimation of (SCHUMM), A., ii, 578.
 estimation of, by perchloric acid (MONTANARI), A., ii, 195.
 estimation of, in soil (RÜMLER), A., ii, 196.
Potatoes, estimation of starch in (BAUMERT, BODE, and FEST), A., ii, 44; (BEHREND and WOLFS), A., ii, 536.
 See also *Agricultural Chemistry*.
Potential. See *Electrochemistry*.
Pottery manufacture, solubility of lead silicates in (THORPE and SIMMONDS), T., 791; P., 1901, 113.
Powder, smokeless, estimation of soluble nitrocellulose in (QUINAN), A., ii, 480.
Pozzuolana, artificial (REBUFFAT), A., ii, 18.
 mortar, action of sea water on (REBUFFAT), A., ii, 18.
Praseodymium (V. SCHÉELE), A., ii, 387.
 atomic weight of (BRAUNER), P., 1901, 65.
 spectrum of (BAUR and MARC), A., ii, 631.
Praseodymium nitride (MATIGNON), A., ii, 61.
 tetroxide and peroxide (BRAUNER), P., 1901, 66.
Precipitates, method for determining the weight of, without separating it from the liquid (THATCHER), A., ii, 685.
Pregnancy, anæmia during (CHARRIN and GUILLEMONAT), A., ii, 611.
 passage of carbon monoxide from mother to fetus during (NICLOUX), A., ii, 608.
Pressure, influence of, on chlorophyllous assimilation (FRIEDEL), A., ii, 267.
Propaldehyde, condensation of, with benzaldehyde (HACKHOFFER), A., i, 277.

- Propaldehyde**, condensation of, with isobutaldehyde (KOHN), A., i, 255.
condensation of, with formaldehyde (KOCH and ZERNER), A., i, 633.
diethyl acetal, β -amino-, acyl, benzyl, and benzylidene derivatives of (WOHL and WOHLBERG), A., i, 514.
carbamide and phenylthiocarbamide of (WOHL and WOHLBERG), A., i, 513.
 β -cyano- (WOHL and SCHÄFER), A., i, 514.
- Propaldehyde**, β -amino-, oxalate of (WOHL and WOHLBERG), A., i, 513.
 $\alpha\beta\gamma$ -trinitro- (TORREY and BLACK), A., i, 12.
- Propane**, $\alpha\gamma$ -diamino-, synthesis of, from glutaric acid (CURTIUS and CLEMM), A., i, 68.
 $\alpha\beta\gamma$ -triamino-, synthesis of, from tricarballic acid, and its tribenzoyl derivative and salts (CURTIUS and HESSE), A., i, 71.
dinitro- (PONZIO), A., i, 452.
- cycloPropane**. See Trimethylene.
- Propanedicarboxylic acids**. See:—
Ethylmalonic acid.
Glutaric acid.
Methylsuccinic acid.
- α -Propanol, β -amino-, and *iso*Propanolamine. See *iso*Propyl alcohol, β -amino-.
- p*- ψ -Propenylanisole (BÉHAL and TIFFENEAU), A., i, 272.
- Propenylcatechol** ethoxymethyl ether (POMERANZ), A., i, 699.
- Propenylphenols**, isomeric, colour reaction to distinguish (CHAPMAN), A., ii, 76.
- iso*Propenylphenylhydantoin (BOUYEAULT and WAHL), A., i, 114.
- Propiobistetric acid** (WOLFF and GABLER), A., i, 285.
- Propionic acid**, $\alpha\beta$ -diamino- (TAFEL), A., i, 427.
 α -bromo-, optically active forms of (RAMBERG), A., i, 63.
 β -chloro-, amyl ester (HAMONET), A., i, 187.
 $\alpha\beta\gamma$ -trinitro-, its anil, aniline, *p*-tolil, *p*-toluidine and metallic salts, and methylimide (TORREY and BLACK), A., i, 12.
- Propionylacetic acid**, ethyl ester (BLAISE), A., i, 363.
- Propionylacetoneitrile** (VAN REYME-NANT), A., i, 127.
- Propionylanilide**, α -cyano- (HALLER and BLANC), A., i, 261.
- Propionylcarbinol** (VAN REYME-NANT), A., i, 126.
- ω -Propionyl 2:4- and -2:5-diethoxy-acetophenone (v. KOSTANECKI and TAMBOUR), A., i, 558.
- Propionylformic acid**, its phenylhydrazone, oxime, and ethyl ester (VAN DER SLEEN), A., i, 500.
- Propionylisopropylacetic acid**, ethyl ester (BLAISE), A., i, 252.
- 6-Propionylresorcinol** mono- and diethyl ethers (v. KOSTANECKI and LLOYD), A., i, 735.
- Propiophenone**, selenium derivative of (KÜNKELL and ZIMMERMANN), A., i, 215.
- n*-Propyl alcohol, influence of, as solvent, on the rotation of ethyl tartrate (PATTERSON), T., 176; P., 1900, 176.
- n*-Propyl alcohol, γ -amino- (HENRY), A., i, 68.
- iso*Propyl alcohol, β -amino- (*β -amino- α -propanol*; *isopropanolamine*) (HENRY), A., i, 16, 68.
and its dibenzoate, picrate and platinichloride (PETERS), A., i, 259.
and its platinichloride (STRAUSS), A., i, 17.
- Propyl-acetaldoxime** and *-iso*acetaldoxime, and the hydrolysis and reduction of the *iso*-compound (DUNSTAN and GOULDING), T., 637; P., 1901, 84.
- Propylacetonedicarboxylic acid**, cyano-, ethyl ester (DERÔME), A., i, 313.
- Propyl-acetoxime** and *-iso*acetoxime and the hydrolysis and reduction of the *iso*-compound (DUNSTAN and GOULDING), T., 634; P., 1901, 84.
- β -*iso*Propyl- γ -acetylbutyric acid (CROSSLLEY), P., 1901, 172.
- α -Propyladipic acid (*heptanedicarboxylic acid*), preparation and dissociation constants of (MELLOR), T., 131; P., 1900, 215.
- iso*Propyl *iso*amyl ketone and its semicarbazone (BLAISE), A., i, 253.
- n*-Propylanhydrazetonebenzils, α - and β - (JAPP and MELDRUM), T., 1040; P., 1901, 176.
- n*-Propylantranilic acid (MEYER), A., i, 191.
- n*-Propylbenzene, preparation of (BODROUX), A., i, 196.
- α -Propylbutanetricarboxylic acid, ethyl ester (MELLOR), T., 131; P., 1900, 215.
- α -*iso*Propyl- β -*iso*butylhydracrylic acid, synthesis and properties of, and its ethyl ester, salts, and lactone (PROTOPOFF and REFORMATSKY), A., i, 447.

- z*-Propylconiine and its salts (HOHENEMSER and WOLFFENSTEIN), A., i, 606.
- Propyldiallylcarbinol, pentahydric alcohol from (MARKO), A., i, 251.
- Propyldihydroisoindole, 2- γ -bromo-, and its hydrobromide and picrate (FRÄNKEL), A., i, 45.
- Propylene, preparation of (NEWTN), T., 917; P., 1901, 147.
- α -chlorohydrin. See α -Chlorohydrin.
- glycol, oxidation of, by *Mycoderma aceti* (KLING), A., i, 625.
- mercuric iodide and its dibenzoyl derivative (SAND), A., i, 458.
- nitrosite (DEMJANOFF), A., i, 493.
- Propylenedicarboxylic acids. See:—
Citraconic acid.
Glutaconic acid.
Mesaconic acid.
- α -Propylglutaric acid (*hexanedicarboxylic acid*), preparation and dissociation constants of (MELLOR), T., 129; P., 1900, 215.
- α -isoPropylglutaric acid (*hexanedicarboxylic acid*), dissociation constants of (MELLOR), T., 129.
- Propylcyclohexane (*propylhexamethylene*) (SABATIER and SENDERENS), A., i, 459; (KURSANOFF), A., i, 493.
- synthesis of (SABATIER and SENDERENS), A., i, 263.
- isoPropylideneacetone. See Mesityl oxide.
- Propylideneaniline sodium hydrogen sulphite, and Propylenedianiline hydrogen sulphite (EIBNER), A., i, 377.
- isoPropylidenebistetrone acid and its dibromide and dibenzoyl derivative (WOLFF and SCHIMPF), A., i, 284.
- β -Propylidenefluorylhydrazine (DIELS), A., i, 522.
- Propylidenehydrazone cyanohydrin, compound of, with benzaldehyde (EIBNER and SENF), A., i, 166.
- isoPropylidene cyclopentene (*dimethylfulvene*) diperoxide (ENGLER and FRANKENSTEIN), A., i, 658.
- Propylidenephénylglycolohydrazide (CURTIUS and MÜLLER), A., i, 779.
- 2-*n*- and -iso-Propyl-4-ketodihydroquinazolines (GOTHELF), A., i, 764.
- Propylmalonic acid (*butanedicarboxylic acid*), cyano-, ethyl ester (MELLOR), T., 130; P., 1900, 215; (HALLER and BLANC), A., i, 261.
- Propyl- ψ -nitrole (SCHÖFER), A., i, 495.
- p*-Propyloxyphenyl-carbamide and -thiocarbamide (SPIEGEL and SABATH), A., i, 534.
- p*-isoPropylphenyl-acetylene and -chloro-acetylene (KUNKELL and KORITZKY), A., i, 75.
- isoPropylphthalide (GUCCI), A., i, 544.
- isoPropylpiperidiniumbromoacetic acid, ethyl ester (WEDEKIND), A., i, 640.
- α -Propylpropanetricarboxylic acid, ethyl ester (MELLOR), T., 129.
- Propyl isopropyl ketone and its semicarbazone (BLAISE), A., i, 253.
- 3-Propyl-5-pyrazolone (BONGERT), A., i, 654.
- 3-Propylpyrazolone-1-carboxylamide (BLAISE), A., i, 363.
- isoPropyl- α -stilbazole and - α -stilbazoline and their salts (BACKE), A., i, 562.
- p*-isoPropylstyrene, $\alpha\beta$ -dichloro- (KUNKELL and KORITZKY), A., i, 75.
- Propylthiocarbimide, β -chloro- $\beta\gamma$ -dibromo- and the action of aniline and benzylamine on (DIXON), T., 560; P., 1901, 50.
- o*-isoPropyltoluene. See *o*-Methylisopropylbenzene.
- Protamine from *Accipenser stellatus* (KURAEFF), A., ii, 462.
- Protamines, composition of (KOSSEL and KUTSCHER), A., i, 107.
- Protease of *Aspergillus niger* (MALFITANO), A., i, 58.
- Proteid decomposition, cause of the increase of, during inanition (KAUFMANN), A., ii, 254; (VOIT), A., ii, 459; (SCHULZ), A., ii, 562.
- increase of, by protoplasmic poisons (ROSTOSKI), A., ii, 261.
- Proteid digestion, theory of (SAWJALOFF), A., ii, 403.
- Proteids (BANG; KOSSEL; JOLLES), A., i, 490.
- formation of, in plants (ZALESKI), A., ii, 619.
- production of, in plants in absence of light (IWANOFF; SCHULZE), A., ii, 184.
- influence of carbohydrates on the production of, in plants (SCHULZE), A., ii, 333.
- conditions of the production of, in plants (MAYER), A., ii, 526.
- reproduction of, from the products of their decomposition (SCHULZE), A., ii, 184.
- synthesis of (PALLADIN), A., ii, 333.
- composition of (KOSSEL and KUTSCHER), A., i, 107; (DENNSTEDT), A., i, 780; (HART), A., i, 783.
- constitution and decomposition products of (HABERMANN and EHRENFELD), A., i, 57.
- influence of temperature on the energy of the decomposition of, in germination (PRANISCHNIKOFF), A., ii, 120.
- decomposition products of (KUTSCHER), A., i, 107.

Proteids, cystin and cystein in the decomposition products of (EMEDEN), A., i, 491.
 physical properties of (POSTERNAK), A., ii, 648.
 basic nature of (OSBORNE), A., i, 781.
 action of pepsin and trypsin on (LAWROFF; DZIERZGOWSKI and SALASKIN), A., ii, 666; (MUCHIZUKI), A., ii, 667.
 oxidation of (JOLLES), A., i, 490; (SCHULZ), A., i, 780.
 estimation of the amounts of oxygen absorbed by, when exposed to the air (NENCKI and ZALESKI), A., ii, 688.
 value of, in nutrition (LICHTENFELT), A., ii, 609.
 antidotes for chemically pure (IDE), A., ii, 464.
 compounds of, with aldehydes (SCHWARZ), A., i, 297.
 combination of, with fat (NERKING), A., i, 491.
 compounds of, with hydrogen chloride (ERB), A., i, 621.
 sugar formation after feeding on (BENDIX), A., ii, 258, 563.
 of horse-serum, the ammonium sulphate method of separating the (BLOXAM), A., ii, 404.
 of green leaves (WINTERSTEIN), A., ii, 619.
 of milk, comparison of the reagents for, with Kjeldahl's method for nitrogen estimations (VIVIAN), A., ii, 363.
 of invertebrate muscle (v. FÜRTH), A., ii, 117.
 of seeds (BOKORNY), A., ii, 415.
 of the thymus gland (PEKELHARING and HUISKAMP), A., i, 175; (HUISKAMP), A., ii, 461.
 of unstriped muscle (VINCENT and LEWIS), A., ii, 255.
 bromination and iodination numbers of (VAUBEL), A., ii, 709.
 Adamkiewicz's reaction for (HOPKINS and COLE), A., i, 310.
 precipitation of, by chloroform (SALKOWSKI), A., i, 241; (KRÜGER), A., i, 621.
 precipitation of, by anhydrous sodium sulphate (PINKUS), A., i, 779.
 estimation of, in fodder (SCHJERNING), A., ii, 79.
 methods of estimating the nitrogen of, in vegetable matter (FRAES and BIZZELLI), A., ii, 140.
Proteids. See also :—
 Albumin.
 Albumoses.

Proteids. See :—
 Amphopeptone.
 Antipeptone.
 Bos-osteoplasmaide.
 Casein.
 Cystein.
 Cystin.
 Edestan.
 Edestin.
 Egg-albumin.
 Fibrin.
 Fibroin.
 Gelatin.
 Globulins.
 Gluco-proteid.
 Hæmatin.
 Hæmocyannin.
 Hæmoglobins.
 Histon.
 Ichthulin.
 Lactomucin.
 Lecithin.
 Melanin.
 Melanoidin.
 Mucosalbumin.
 Nucleins.
 Nucleo-histon.
 Nucleo-proteids.
 Osseo-mucoid.
 Ovalbumin.
 Peptone.
 Protoplasmides.
 Robin.
 Serum-albumin.
 Serum-globulin.
 Spongio-melanoidin.
 Syntonins.
 Thymine.
 Thyreo-globulin.
 Vitellin.
Proteinochrome (KLUG), A., i, 623.
Protocatechuic acid, (3:4-dihydroxybenzoic acid), acidimetric estimation of (IMBERT), A., ii, 45.
 2:5- and 5:6-dichloro-, and their methyl esters (MAZZARA), A., i, 720.
Protopine and its salts (SCHMIDT), A., i, 742; (FISCHER), A., i, 743; (WINTGEN), A., i, 744.
Protoplasmide in tissue (ÉTARD), A., ii, 563.
Protoplasmides, breaking down of (ÉTARD), A., i, 490.
Protoplasm, sensitiveness of, and its relation to enzymes (BOKORNY), A., i, 177, 435; (KONING), A., i, 177.
Prussian blue, rapid method for the estimation of, in spent oxide (POPPLEWELL), A., ii, 352.
 estimation of, in spent gas purifying material (NAUSS), A., ii, 43.

- Pseudoaconitine**, physiological action of (CASH and DUNSTAN), A., ii, 613.
- Pseudo-acid** from agaric (ADRIAN and TRILLAT), A., i, 211.
- Pseudo-solutions**, size of the particles in (DE BRUYN), A., ii, 90.
- Psylla wax**, **Psyllostearyl alcohol**, and **Psyllostearic acid** and its benzoate (SUNDWICK), A., i, 358.
- Ptyalin**, amylolytic action of (MASZEWSKI), A., i, 178; (BIELEFELD; KRÜGER), A., ii, 561.
- Ptyalin activity** (MASZEWSKI), A., i, 178.
- Pulegone**, oxidation of (BOUVEAULT and TETRY), A., i, 364.
- Purgic acid** (KROMER), A., i, 629.
- Purine**, 5-amino-, and its salts (TAFEL and ACH), A., i, 426.
- Purine derivatives**, diuretic action of (ACH), A., ii, 31.
 pharmacological action of some (SCHMIEDEBERG), A., ii, 674.
 influence of caffeine and theobromine on the excretion of, in the urine (KRÜGER and SCHMID), A., ii, 463.
- Purone** and *iso***Purone** and the action of acetic anhydride on (TAFEL), A., i, 236.
- Pus**, an oxidising ferment in (VITALI), A., ii, 672.
 dropsical, albumins in (MALMÉJAC), A., ii, 566.
- Pyocyanase**, nutrition of (LOEW and KOZAI), A., ii, 675.
- Pyraconitine**, physiological action of, in relation to its constitution (CASH and DUNSTAN), A., ii, 612.
- Pyranthin**. See *p*-Ethoxyphenylsuccinimide.
- Pyrazole**, $C_4H_5O_4N_2$, from the action of phenylhydrazine on ethyl formylglutamate (WISLÉNUS and BINDEMANN), A., i, 361.
- Pyrazole-** and **Pyrazoline-3:4:5-tricarboxylic acids** (BUCHNER and V. D. HEIDE), A., i, 232.
- Pyrazoline-3-carboxylic acid**, methyl ester (V. PECHMANN and BURKARD), A., i, 167.
- Pyrazolone-3-carboxylic acid** (FENTON and JONES), T., 94; P., 1900, 205.
- Pyridine**, action of monohaloid aliphatic acids on (SIMON and DUBREUIL), A., i, 290.
 action of benzyl chloride and iodide on (TSCHITSCHIBABIN), A., i, 484.
 action of, on diacetyltartaric anhydride (WOHL and OESTERLIN), A., i, 365.
 use of, for molecular weight determinations by the ebullioscopic method (INNES), T., 261; P., 1900, 223.
- Pyridine**, compounds of, with carbonyl chloride, methyl chlorocarbonate and salol chlorocarbonate (FARBEN-FABRIKEN VORM. F. BAYER & Co.), A., i, 662.
 compounds of, with chloro- and bromo-anil (IMBERT), A., i, 651.
 compounds of, with chloromethyl ether (LITERSCHIED), A., i, 443.
 compounds of, with metallic salts (TOMBECK), A., i, 164, 267.
 compounds of, with platinum salts (JÖRGENSEN), A., i, 163.
 compounds of, with titanium bromide and chlorides (ROSENHEIM and SCHÜTTE), A., ii, 244.
 compound of, with water (BREDIG), A., i, 608.
 derivatives, synthesis of (GUARESCHI), A., i, 341.
 benzyl iodide (TSCHITSCHIBABIN), A., i, 484.
 bismuth salts (MONTMARTINI), A., i, 163; (VANINO and HAUSER), A., i, 289.
 pentachlorochromate, constitution of (PREIFFER), A., ii, 659.
 hydrochloride, compound of, with trichlorotrihydrochromium (PREIFFER), A., ii, 659.
- Pyridine**, chlorine derivatives of (SELL and DOOTSON), T., 899; P., 1901, 131.
- Pyridine bases**, chloro-derivatives of (CHEMISCHE FABRIK VON HEYDEN), A., i, 748.
- Pyridine-3-carboxylic acid**. See Nicotinic acid.
- Pyridine-4-carboxylic acid**. See *iso*Nicotinic acid.
- Pyridine-2:3-dicarboxylic acid**. See Quinolinic acid.
- Pyridine-3:4-dicarboxylic acid**. See Cinchomeronic acid.
- Pyridine series**, determination of the dielectric constants of substances of the (LADENBURG), A., ii, 634.
- Pyridine 2:3:4-tricarboxylic acid**, and its methyl and ethyl esters (MEYER), A., i, 750.
- β -Pyridinummalic acids** (*pyridine-aminosuccinic acids*), *d*-, *l*-, and *i*-, and their salts (LUTZ), A., i, 8.
- Pyridone**, cyano-derivatives, physiological action of (DEHRT), A., ii, 328.
- Pyridones**, constitution of (DECKER), A., i, 96.
- Pyridylchlorodihydroxyquinone** and its benzoyl and ethyl salts (IMBERT), A., i, 652.
- Pyridyl*l*-chlorohydroxyquinone** and the action of potash on (IMBERT), A., i, 651, 652.

Pyridoxazinone-*p*-benzoic acid (FULDA), A., i, 226.

Pyrimidine and 2:4:6-*trichloro-* (GABRIEL), A., i, 168.

Pyrimidine compounds, physiological action of (STEUDEL), A., ii, 409.

Pyrites from Roumania (BUTZUREANU), A., ii, 662.
alteration of, by underground water (EVANS), A., ii, 167.
estimation of copper in (HEIDENREICH), A., ii, 197.
estimation of gold and silver in (BUDDËUS; LOEVY), A., ii, 133.
estimation of sulphur in (PELLET), A., ii, 622.

Pyrogalloldisulphonic acid and its barium and calcium salts (DELAGE), A., i, 274, 643.

Pyrogallolsulphonic acid and its salts (DELAGE), A., i, 643.

Pyromellitic acid (VERNEUIL), A., i, 546.

Pyromucic acid and **Pyromucyl chloride**, preparation of (FRANKLAND and ASTON), T., 515; P., 1901, 41.

Pyromucic acid and *iso***Pyromucic acid** and their salts and derivatives (CHAVANNE), A., i, 649.

Pyromucic anhydride (BAUM), A., i, 735.

Pyromucylhydroxamic acid and its benzoyl derivative (PICKARD and NEVILLE), T., 847; P., 1901, 127.

***α*-Pyrone-*α*'-carboxylic acid**. See Coumalin-6-carboxylic acid.

Pyrosmalite from Nordmark, Sweden (ZAMBONINI), A., ii, 607.

Pyrotartaric acid. See Methylsuccinic acid.

***n*-Pyrotartaric acid**. See Glutaric acid.

Pyroxene, rhombic, from South Africa (BOWMAN), A., ii, 168.
sodiferous, from Oropa, Biellesi (ZAMBONINI), A., ii, 398.

Pyrrrole, *diiododinitro-* and *triiodonitro-* (COUSIN), A., i, 347.

Pyrrroles, occurrence of intermediate products in the synthesis of, from 1:4-diketones (KNORR and RABE), A., i, 163.
3-nitroso- (ANGELICO and CALVELLO), A., i, 747.

Pyrrrole ring, a characteristic fission of the (DUDEN and HEYNSIUS), A., i, 747.

Pyrrrolidine-2-carboxylic acid from egg-albumin and gelatin (FISCHER), A., i, 745.

1-Pyrrrolidine-2-carboxylic acid and its phenylcarbimide and anhydride (FISCHER), A., i, 781.

Pyrrrolidines, amino- (PAULY and SCHAUM), A., i, 607.

Pyruvic acid, preparation of, action of ammonium carbonate on, and estimation of (DE JONG), A., i, 130.
action of heat on (WOLFF and HEROLD), A., i, 499.
condensation of, with benzaldehyde (ERLENMEYER), A., i, 390.
action of hydrochloric acid on, and its sodium sulphite compound (DE JONG), A., i, 446.
hydrazone of (FENTON and JONES), T., 91; P., 1900, 205; 1901, 24.
nitrotylhydrazone and its ethyl ester (POPE and HIRD), T., 1142; P., 1901, 186.
phenylhydrazide, nitroso-, tautomeric form of, and phenylhydrazone and *p*-nitrophenylhydrazone derivatives of (BAMBERGER and GROB), A., i, 292.

Pyruvic acid, ethyl ester, phenyl hydrazones of, isomeric (SIMON), A., i, 49.
menthyl ester (COHEN and WHITELEY), T., 1309; P., 1900, 213.

Pyruvic acid-8-*o*-, -*m*-, and -*p*-phenylbenziminooazolehydrazone (MIKLASZEWSKI and V. NIEMENTOWSKI), A., i, 762.

Q.

Quartz from the Simplon Tunnel (SPEZIA), A., ii, 393.
solubility of, in solutions of borax (SPEZIA), A., ii, 605.
smoky, colour of (v. KRAATZ-KOSCHLAU and WÖHLER), A., ii, 166; (KOENTGSBERGER), A., ii, 167.

Quercitrin, sugar of (VOTOČEK and FRIČ), A., i, 161.

Quillaia smegmadernos, presence of sucrose in (MEILLÈRE), A., ii, 185.

Quinaldine. See 2-Methylquinoline.

Quinhydrone, formation and constitution of (VALEUR), A., i, 155.

Quinic acid, occurrence of (v. LIPPMANN), A., i, 389.

Quinine alkyl and chloro-carbonates (VEREINIGTE CHININFABRIKEN ZIMMER & Co.), A., i, 738, 739.
dibromide hydrobromide perbromide and its mercury salt, and dibromide and dibromoheraupathite (CHRISTENSEN), A., i, 481.
glycerophosphate, analysis of (PRUNIER), A., ii, 51.
"saccharinate," basic (DÉFOURNEL), A., i, 482.

Quinitol, hydrocarbon, C₁₂H₁₆, from (WILLSTÄTTER and LESSING), A., i, 265.

o-Quinocatechol ether, *hexabromo*- (JACKSON and KOCH), A., i, 597.

Quinol, preparation of (KEMPF), A., i, 728.

diphenyl ether and its *p*-amino- and *p*-nitro-derivatives (HAEUSSERMANN and MÜLLER), A., i, 382.

Quinol, chloro-derivatives, thermochemistry of (VALEUR), A., i, 154.

2:3-dicyano- (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 699.

Quinols, relation between the constitution of, and their tendency to form quinones (KEHRMANN), A., i, 29.

ψ-Quinols (ZINCKE), A., i, 204.

and imino-, formation of (BAMBERGER), A., i, 140, 203.

Quinoline, action of monohaloid aliphatic acids on (SIMON and DUBREUIL), A., i, 290.

compound of, with α-chlorohydrin, and base from (BIENENTHAL), A., i, 129.

bismuth salts (VANINO and HAUSER), A., i, 289.

bismuth chloride (SCHIFF), A., i, 375.

titanichloride (ROSENHEIM and SCHÜTTE), A., ii, 245.

Quinoline, 2-bromo-, nitro-derivatives of (DECKER), A., i, 654.

*tri*iodo-, and its salts, and *di*- and *tri*-iodonitro- (EDINGER and SCHUMACHER), A., i, 46.

5-nitro-, and its hydrochloride and ethiodide (DECKER), A., i, 611.

7-nitro-, ethiodide (DECKER), A., i, 654.

*iso*Quinoline, *di*- and *tri*-iodo-, and their salts (EDINGER and SCHUMACHER), A., i, 46.

β-Quinolinebenzimidazo-les, and their salts (MIKLASZEWSKI and v. NIEMENTOWSKI), A., i, 762.

Quinolinic acid (*pyridine*-2:3-*dicarboxylic acid*), derivatives of (KIRPAL), A., i, 227.

methylbetaine and methochloride of, and esters and amide of the betaine (KIRPAL), A., i, 564.

its esters, and its 2-methyl and 2-ethyl esters and 3-chloride, and their salts (MEYER), A., i, 750.

Quinoliniumiodoacetic acid, methyl ester (WEDEKIND), A., i, 640.

2-Quinolone-4-acetic acid and its ethyl ester (BESTHORN and GARBEN), A., i, 79.

7-amino-, and its ethyl ester (BESTHORN and GARBEN), A., i, 97.

Quinolones, constitution of (DECKER), A., i, 96.

Quinolylenephenylene ketone and its oxime and phenylhydrazones (NÖLTING and BLUM), A., i, 728.

Quinolylenephenylenemethane (NÖLTING and BLUM), A., i, 728.

Quinone, preparation of (KEMPF), A., i, 728.

action of ethyl mercaptan on (TARBOURIECH), A., i, 329.

action of nitrous acid on (SCHMIDT), A., i, 88.

Quinone, chloro-derivatives, thermochemistry of (VALEUR), A., i, 154.

o-Quinone, derivatives of (JACKSON and KOCH), A., i, 597.

Quinones, estimation of, quantitatively (VALEUR), A., i, 155.

Quinones, list of. See Ketones and Quinones.

Quinonebenzoyl-α-naphthylhydrazone (McPHERSON and GORE), A., i, 572.

Quinonediphenylimide, amino- (BÖRNSTEIN), A., i, 375.

Quinoneoxime. See Phenol, 4-nitroso-.

Quinophthalines, isomeric, and their salts and bromo-derivatives (EIBNER and LANGE), A., i, 349.

Quinophthalone, preparation, constitution and bromo- and nitro-derivatives of (EIBNER and LANGE), A., i, 348.

Quinophthaloneanil (EIBNER and LANGE), A., i, 349.

Quinotoxine, action of *p*-bromophenylhydrazine on, and its nitroso-derivatives and their salts (v. MILLER and ROHDE), A., i, 95.

Quinoxaline-2:3-diacetic acid, ethyl ester, and its sodium salt (THOMAS-MAMERT and STRIEBEL), A., i, 614.

R.

Rabbits, action of anaesthetics on (WRIGHT), A., ii, 180.

Racemic acid. See under Tartaric acid.

Racemisation (MINGUIN and DE BOLLE-MONT), A., ii, 497.

of α-bromocamphor (KIPPING), T., 370; P., 1901, 32.

Radio-activity. See Photochemistry.

Radium, gases made active by (CURIE and DEBIERNE), A., ii, 298.

physiological action of rays from (GIESEL), A., ii, 99.

Radium salts, radio-activity induced by (BECQUEREL), A., ii, 215; (CURIE and DEBIERNE), A., ii, 216, 589.

"*Radix Naregamia*," composition of (HAUKE), A., ii, 70.

Radix Rhapontici, glucosides in (AWENG), A., i, 39.

- Raffinose** (*melitose*; *melitriose*), inversion of, by an enzyme from *Penicillium glaucum* (GILLOR), A., ii, 121.
- Rate of reactions.** See Affinity.
- Rays.** See Photochemistry.
- Realgar.** See Arsenic sulphide.
- Red rain.** See under Water.
- Reflux apparatus** (CAZENEUVE), A., ii, 379.
- Refraction.** See Photochemistry.
- Rennet**, curdling of milk by (DE VRIES and BOEKHOFF), A., ii, 258.
- Rennet-ferment**, estimation of, in gastric juice (MEUNIER), A., ii, 115.
- Rennin** and diastase in pancreatic extracts (VERNON), A., ii, 710.
- Resins**, natural (BAMBERGER and VISCHNER), A., i, 220.
 formation of, in several Abietes (TSCHIRCH and FABER), A., i, 601.
 of elder tree bark (MALMÉJAC), A., ii, 572.
 of Natal aloes (TSCHIRCH and KLAVERNES), A., i, 399.
 of *Pinus Pinaster* (TSCHIRCH and BRÜNING), A., i, 220.
 of *Pinus sylvestris* (TSCHIRCH and NIEDERSTADT), A., i, 397.
 sandarac, constituents of (HENRY), T., 1144; P., 1901, 187.
 See also Copals.
- Resins.** See also :—
 Bordoresen.
 Juroresen.
 Karabin.
 Kauroresen.
 Nataloresinotannol.
 Silvoresen.
- Resorcinol**, heat of solution of, in ethyl alcohol (SPEYERS and ROSELL), A., ii, 147.
 transformation of, into amines (BADISCHE ANILIN- and SODA-FABRIK), A., i, 696.
 diphenyl ether, *dinitro*- (JACKSON and CONJOE), A., i, 585.
 ethyl ether, bromo*dinitro*- (JACKSON and EARLE), A., i, 586.
- Resorcinol-mono- and -di-carbodiethylamides** (EINHORN and ESCALES), A., i, 653.
- Resorcinolcarbohydrazide** (EINHORN and ESCALES), A., i, 653.
- Resorcylmaleic acid.** See β -2:4-Dihydroxyphenylmaleic acid.
- Resorption** of one solution by another (OKER-BLOM), A., ii, 543.
- Respiration** in Annelids (BOUNHOL), A., ii, 517.
 of the marmot (PEMBREY), A., ii, 608.
 of plants. See Agricultural Chemistry.
- Respiratory exchange** in tuberculosis (ROBIN and BINET), A., ii, 327.
 quotient in geese (BLEIBTREU), A., ii, 457.
- Retenequinone**, action of phenylhydrazine on (BAMBERGER and GROB), A., i, 280.
- Reversibility**, some conditions of (COLSON), A., ii, 238.
- Rhamnazin** and **Rhamnetin** (PERKIN and ALLISON), P., 1900, 181.
- Rhamnose** from quercitrin and xanthorhamnin (VOTOČEK and FRIČ), A., i, 161.
- Rhodesse** and its derivatives (VOTOČEK), A., i, 368.
- Rhodium alums** (PICCINI and MARINO), A., ii, 392.
- Rhodium**, estimation and separation of, in platinum ores (LEIDIÉ), A., ii, 62; (LEIDIÉ and QUENNESSEN), A., ii, 695.
 separation of, from iridium (PICCINI and MARINO), A., ii, 392.
- Rhodizonic acid**, energy of (COFFETTI), A., i, 29.
- Rhodochrosite** from Roumania (PONT), A., ii, 26.
- Rhododendrin** and **Rhododendrol** (ARCHANGELSKI), A., i, 734.
- Rhubarb**, chemistry of (HUNKEL), A., ii, 268.
 glucosides in (AWENG), A., i, 39.
- Ricin immunity** (JACOBY), A., ii, 673.
- Ricinus meal.** See Agricultural Chemistry.
- Rigor** in frog's muscles (STEVENS), A., ii, 519.
- Ring compounds**, luminescence of (KAUFFMANN), A., i, 318.
 of four carbon atoms, formation of (MICHAEL), A., i, 123.
 containing sulphur (AUTENRIETH and HENNINGS), A., i, 560.
- Ring formation**, influence of the methyl group on (GILBODY and SPRANKLING), P., 1900, 224.
- Robellazite** from Colorado (CUMENGE), A., ii, 111.
- Robin** from *Robinia Pseudacacia* (POWER), A., ii, 679.
- Robinia Pseudacacia*, constituents of the bark of (POWER), A., ii, 679.
 colouring matter from the flowers of (PERKIN), P., 1901, 87.
- Robinin** and its decomposition (PERKIN), P., 1901, 87; (SCHMIDT), A., i, 602.
- Rocks** of Ceylon (COOMÁRA-SWÁMY), A., ii, 171.
 from the Newlands Diamond Mines, South Africa (BONNEY), A., ii, 251.

- Rocks**, crystalline, presence of argonides, arsenides, iodides, and nitrides in (GAUTIER), A., ii, 398.
 igneous, gases liberated by the action of heat on (GAUTIER), A., ii, 171.
 British igneous, composition of (HARKER), A., ii, 114.
 volcanic, of Etinde, Cameroons (ESCH), A., ii, 322.
- Rock analyses** (CLARKE), A., ii, 66.
 recalculation of (KEMP), A., ii, 251.
 some principles and methods of (HILLEBRAND), A., ii, 75.
- Rocks**, new names. See :—
 Heumite.
 Koswite.
- Röntgen-rays**. See Photochemistry.
- Roots**. See Agricultural Chemistry.
- Rosaniline bases**, coloured (WEIL), A., i, 100.
- Rose oils**, German and Bulgarian (SCHIMMEL & Co.), A., i, 395.
 phenylethyl alcohol in (v. SODEN and ROJAHN), A., i, 39, 733.
- Rose wood**, female, oil of (THEULIER), A., i, 396.
- Rosindone**, 1-amino-, and its acetyl derivative (KEHRMANN and MISSLIN), A., i, 423.
 2-amino-, and its acetyl derivative (KEHRMANN and STEINER), A., i, 102.
 3-amino-, and its acetyl derivative (KEHRMANN and SILBERSTEIN), A., i, 103.
 4-amino-, and its acetyl derivative (KEHRMANN and STEINER), A., i, 101.
 5-amino-, and its acetyl derivative (KEHRMANN and BARCHÉ), A., i, 48.
- Rosinduline**, isomerides of, relation between colour and constitution of (KEHRMANN), A., i, 52.
 chloride, 9-chloro- (9-chloro-5-amino-7-phenyl-naphthaphenazonium 7-chloride) (KEHRMANN and KRAZLER), A., i, 420.
- Rosinduline**, amino-, acetyl derivatives of, and their chlorides (KEHRMANN and OTT), A., i, 767.
 2-amino-, and its salts (KEHRMANN and STEINER), A., i, 102.
- iso***Rosinduline** No. 8, constitution of (KEHRMANN and MISSLIN), A., i, 422.
 No. 9, formation and constitution of (KEHRMANN and DENK), A., i, 89 ; (KEHRMANN and STEINER), A., i, 101.
 No. 10, structure of (KEHRMANN and STEINER), A., i, 100.
- iso***Rosinduline** No. 12, formation and constitution of (KEHRMANN and DENK), A., i, 89 ; (KEHRMANN and STEINER), A., i, 100.
 No. 13, preparation and structure of (KEHRMANN and SILBERSTEIN), A., i, 103.
 No. 14 (KEHRMANN and OTT), A., i, 767.
 No. 15 (KEHRMANN and NÜESCH), A., i, 767.
- iso***Rosinduline** chloride, acetyl derivative of, and its salts (KEHRMANN and OTT ; KEHRMANN and NÜESCH), A., i, 767.
- iso***Rosinduline**, chloro- (9-chloro-7-phenyl-naphthaphenazonium), and its salts (KEHRMANN and KRAZLER), A., i, 421.
- Rosindulines**, 10-chloro-, interaction of, with aromatic bases (KEHRMANN and HIBY), A., i, 419.
- Rosolic acid**, triacetyl derivative (HERZIG and WENGRAF), A., i, 703.
- Roumanite** from Roumania (PONT), A., ii, 27.
- Rubazonic acid** in urine after administration of pyrimidone (JAFFÉ), A., ii, 673.
- Rubidic acid** and its potassium salt (HESSE), A., i, 596.
- Rubidium** chloride, double salt of, with indium trichloride (KLEY), A., ii, 626.
 molybdenyl chloride (NORDENSKJÖLD), A., ii, 454.
 acid nitrates (WELLS and METZGER), A., i, 652.
 nitriopenta-chloro-osmate (WERNER and DINKLAGE), A., ii, 661.
 telluriphosphate (WEINLAND and PRAUSE), A., ii, 600.
 sulphate, double salt of, with indium sulphate (CHABRIÉ and RENGADE), A., ii, 102.
 rhodium alum (PICCINI and MARINO), A., ii, 392.
- Rue**, Algerian, oil of (v. SODEN and HENLE), A., i, 396.
- Rum**, absence of methyl alcohol in (WOLFF), A., i, 110 ; (QUANTIN), A., i, 111.
- Ruthenium** complex compounds (MIO-LATI and TAGIURI), A., ii, 246.
- Ruthenium**, nitroso-compounds, reduction of, and double salts (BRIZARD), A., ii, 107.
 di- and tri-sulphides (ANTONY and LUCCHESI), A., ii, 247.
- Ruthenium**, estimation and separation of, in platinum ores (LEIDIÉ), A., ii, 62 ; (LEIDIÉ and QUENNESSEN), A., ii, 695.

Rutin and its decomposition (SCHMIDT and WALLASCHKO), A., i, 602.
 Rye and Rye grass. See Agricultural Chemistry.

S.

Saccharimeter, a simple fermentation (HAMBERGER), A., ii, 354.
 "Saccharin" (*o-benzoisulphinate*), action of, on diphenylcarbazine (DÉFOURNEL), A., i, 487.
 action of, on gastric digestion (CHASSEVANT), A., ii, 323.
 metallic salts of (DÉFOURNEL), A., i, 324.
 new reaction of (LEYS), A., ii, 488.
 new method of testing (GLÜCKSMANN), A., ii, 588.
 new method for the detection of, alone, and in presence of salicylic acid (RIEGLER), A., ii, 46.
 detection of, in commercial products (SPICA), A., ii, 704.
 detection of, in beer and wine free from salicylic acid (WIRTHLE), A., ii, 135.
 detection of, in wine (WIRTHLE), A., ii, 704.
 estimation of, in alimentary substances (DÉFOURNEL), A., ii, 588.
 estimation of, in beverages (DELLE), A., ii, 46.
 "Saccharin," chloro-derivatives of (MASELLI), A., i, 271.
 Saccharose. See Sucrose.
 Saffron, adulteration of (FRESENIUS and GRÜNHUT), A., ii, 211.
 "Saffron essence," analysis of (FRESENIUS and GRÜNHUT), A., ii, 211.
*iso*Safraninone and its chloride and nitrate (KEHRMANN and KRAMER), A., i, 52.
 Safrole, action of iodine and yellow mercuric oxide on (BOUGAULT), A., i, 383, 392.
 and *iso*Safrole, colour reactions of (CHAPMAN), A., ii, 76.
 Sagrada, glucosides in (AWENG), A., i, 39.
 Salicylaldehyde methyl ether, new method of preparing (IRVINE), T., 668; P., 1901, 88.
 nitrotolylhydrazine (POPE and HIRD), T., 1143; P., 1901, 186.
 Salicylhydroxamic acid, ethyl ether (ANGELICO and FANARA), A., i, 708.
 Salicylic acid, action of chlorine on (TARUGI), A., i, 146.
 and its salts, titration of (TELLE), A., ii, 357.
 new method of detecting, alone, and in the presence of "saccharin" (RIEGLER), A., ii, 46.

LXXX. ii.

Salicylic acid, detection of, in beer and wine (PEREIRA), A., ii, 428.
 detection and estimation of, in wines and foods (PELLET), A., ii, 701.
 detection and estimation of, in wines (PELLET), A., ii, 207, 701; (FERREIRA DA SILVA), A., ii, 291.
 detection of, in wines (FERREIRA DA SILVA), A., ii, 585.
 detection of, in urine (PETERMANN), A., ii, 293.
 estimation of, in dressings (FRERICHs), A., ii, 204; (TELLE), A., ii, 698.
 Salicylic acid, bismuth salt (THIBAUT), A., i, 593, 712.
 sodium salt, elimination of, by the bile (LISSOISSIER), A., ii, 564.
 Salicylic acid, benzyl ester (AKTIEN-GESELLSCHAFT FÜR ANILINFABRIKATION), A., i, 712.
 glyceryl ester (TÄUBER), A., i, 538.
 phenyl ester (*salol*), chlorocarbonate of (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 697.
 titration of (TELLE), A., ii, 357.
 estimation of, in dressings (TELLE), A., ii, 698.
 Salicylidenebisbarbituric acid (CONRAD and REINBACH), A., i, 411.
 Saliva, activity of, in various diseases (ROBERTSON), A., ii, 68.
 acidity of (BERTHELOT), A., ii, 611.
 dog's, osmotic pressure of (NOLF), A., ii, 176.
 human, variation of the quantity of potassium thiocyanate in (GROBER), A., ii, 402; (SCHNEIDER), A., ii, 459.
 Salivary secretion (MATHEWS), A., ii, 176.
 Salol. See Salicylic acid, phenyl ester.
 Salt lakes. See under Water.
 Salt precipitation by vaporisation of dilute solutions (SKIRROW and CALVERT), A., ii, 440.
 Salt vapours, electrical conductivity of (WILSON), A., ii, 490.
 Saltpetre. See Potassium nitrate.
 Salts, determination of the constitution of complex, by electrolytic transference (RIEGER), A., ii, 638.
 electrolysis of, in organic solvents (SPERANSKY and GOLDBERG), A., ii, 157.
 electrolysis of fused (LORENZ), A., ii, 538.
 theory of the decomposition potentials of fused (LORENZ), A., ii, 142.
 aqueous solutions of double, conductivities of (LINDSAY), A., ii, 143; (JONES and CALDWELL), A., ii, 375.

- Salts**, relation of the viscosity of mixtures of solutions of inorganic, to their state of ionisation (BARNES), A., ii, 374.
- influence of acids on the solubility of, containing the same ion (ENKLAAR), A., ii, 494.
- action of normal, on solutions containing hydroxyl ions (DOYER VAN CLEEFF), A., ii, 505.
- hydrolysis of (KULLGREN), A., ii, 149.
- analysis of mixtures of two (WINKLER), A., ii, 129.
- Samadera indica*, constituents of (VAN DER MARCK), A., ii, 71, 334.
- Samarium**, spectrum of (DEMARÇAY), A., ii, 102.
- Samarium carbide** (MOISSAN), A., ii, 61.
- nitride (MATIGNON), A., ii, 61.
- Samarskite**, analysis of (LEVY), A., ii, 281.
- Sambucine** (MALMÉJAC), A., ii, 572.
- Sandalwood oil**, West Indian, constituents of (v. SODEN and ROJAHN), A., i, 159.
- Sanguinaria canadensis*, alkaloids of (SCHMIDT; FISCHER), A., i, 742.
- Sanguinarine** from *Chelidonium majus* and *Sanguinaria canadensis* (SCHMIDT; FISCHER), A., i, 742.
- Santalenic acid**, and its salts, methyl ester and bromine derivative (CHAPMAN), T., 134; P., 1900, 204.
- Sap.** See Agricultural Chemistry.
- Saponins** and their distribution (WEIL), A., i, 648.
- occurrence of, in Cactaceæ (HEYL), A., i, 738.
- Sarcosine ethyl ester** and its picrate (FISCHER), A., i, 193.
- Scapolite** from Galle (COOMARA-SWAMY), A., ii, 171.
- Schenkia blumenaviana*, red colouring matter from (MOLISCH), A., ii, 571.
- Schiff's bases**, compounds of, with sulphurous acid and the alkali hydrogen sulphites (EISNER), A., i, 376.
- Schinoxydase** (SARTHOV), A., i, 624.
- Schröterite** (ZAMBONINI), A., ii, 397.
- Scopolamine** from mandragora roots (THOMS and WENTZEL), A., i, 405.
- relation of, to *i*-scopolamine (GADAMER), A., i, 605.
- Sea water.** See under Water.
- Seaweed** as food (SOLLEID), A., ii, 529.
- Sebacic diazomide** and hydrazides and their derivatives (CURTIUS and STELLER), A., i, 70.
- Secretion**, nasal and conjunctival, thiocyanates in (MUCK), A., ii, 117.
- Seeds.** See Agricultural Chemistry.
- Selenates**, double, of the type $R_2M(SeO_4)_2 \cdot 6H_2O$, crystallography of (TUTON), A., ii, 546.
- Selenium hydride**, heat of formation of (DE FORCRAND), A., ii, 641.
- Selenium derivatives** of aromatic ketones (KUNCKELL and ZIMMERMANN), A., i, 214.
- Selenium**, influence of, on the tests for arsenic (BERRY), A., ii, 423; (ROSENHEIM), A., ii, 531.
- detection of, in sulphuric acid (ORLOFF), A., ii, 192; (JOUVE), A., ii, 421.
- Selenium-tellurium-sulphur group**, replacements in the (KRAFFT and STEINER), A., ii, 235.
- Selenocyanic acid**, ethyl ester (WHEELER and MERRIAM), A., i, 515.
- Seminase**, presence of, in non-germinating seeds containing horny albumen (BOURQUELOT and HÉRISSEY), A., ii, 69.
- influence of sodium fluoride on the action of, on the carbohydrates in the horny albumen of seeds (HÉRISSEY), A., ii, 570.
- Semithiocarbazides**, isomeric (BUSCH and HOLZMANN), A., i, 234.
- Sequoia gigantea*, tannin in (HEYL), A., i, 648.
- Serpentine** from Bosnia (KIŠPATIO), A., ii, 321.
- Serradella.** See Agricultural Chemistry.
- Serum**, influence of chemical reaction on the bactericidal action of (HEGELE), A., ii, 567.
- horse-, the ammonium sulphate method of separating the proteids of (BLOXAM), A., ii, 404.
- muscular (RICHTER), A., ii, 117.
- Serum-albumin** and -globulin, characteristics of (GUÉRIN), A., ii, 211.
- Serum-globulin**, action of, on the coagulation of muscle plasma (SPIRO), A., ii, 670.
- Sesamé oil**, Baudouin's test for, and Tambon's modification of the test (UTZ), A., ii, 483.
- Brein's reaction for (VANDELDELDE), A., ii, 48.
- detection of, in chocolate (POSSETTO), A., ii, 703.
- detection of, in animal and vegetable oils (TAMBON), A., ii, 360.
- Sewage**, Odessa, composition of (SELIWANOFF, CHOINA, MOTCHAN, and BONDAREFF; SELIWANOFF), A., ii, 530.
- Sewers**, formation of hydrogen sulphide in (BEYERINCK), A., ii, 119.
- Shale oil**, Scottish, bases in (GARRETT and SMYTHE), P., 1900, 185.

Sheep. See Agricultural Chemistry.

Silicon, spark spectrum of (HARTLEY), A., ii, 367.

Silicon carbide as a reducing agent (NEUMANN), A., ii, 98.

Silicic acid, gelatinous, from the Simphon Tunnel (SPEZIA), A., ii, 393.

in connective tissue (SCHULZ), A., ii, 257.

separation of, from tungstic acid (HERTING), A., ii, 284; (WELLS and METZGER), A., ii, 534.

Silicates, theory of (VERNADSKY), A., ii, 249.

spectrographic analysis of (HARTLEY and RAMAGE), T., 67; P., 1900, 191.

estimation of ferrous oxide in (DE KONINCK), A., ii, 284.

Metasilicic acid (BUTZUREANU), A., ii, 652.

Hydrofluosilicic acid. See under Fluorine.

Silicotungstic acid as a reagent for the urinary alkaloids (GUILLERMARD), A., ii, 521.

Silicon organic compounds :—

tetraphenyl and tetraethyl, preparation of (KIPPING and LLOYD), T., 451; P., 1901, 32.

Silicon, commercial metallic, analysis of (NEUMANN), A., ii, 127.

Silico-spiegels, analysis of (IBBOTSON and BREARLEY), A., ii, 199.

Silk, distinguishing between artificial and natural (SOLARO), A., ii, 52.

Silveolic acid, α - and β -**Silvinolic acids** and **Silvoresen** (TSCHIRCH and NIEDERSTADT), A., i, 397.

Silver, recovery of, from cupriferous materials (GODSALL), A., ii, 42.

allotropic modifications of (BERTHELOT), A., ii, 156.

electrochemical relations between the (BERTHELOT), A., ii, 301.

melting point of (HOLBORN and DAY), A., ii, 85.

action of ammonia on, at high temperatures (BELLBY and HENDERSON), T., 1253; P., 1901, 190.

behaviour of, towards carbon monoxide, hydrogen, and oxygen (BERTHELOT), A., ii, 97.

action of, on hydrogen bromide and the inverse reaction (JOUNIAUX), A., ii, 601.

germ theory (PRECHT; PRECHT and STRECKER), A., ii, 1.

Silver alloys from Egyptian tombs (BERTHELOT), A., ii, 514.

Silver alloys with copper, certain properties of (ROBERTS-AUSTEN and ROSE), A., ii, 25.

with mercury, heat of formation of (BERTHELOT), A., ii, 156.

Silver salts, action of, on ammonium persulphate solution (MARSHALL), A., ii, 156.

bromide emulsions, influence of the medium on the photochemical effect in (AEDEG and IMMERWAHR), A., ii, 217.

platininitrobroimide (MIOLATI and BELLUCCI), A., ii, 246.

chlorate, decomposition of (SODEAU), T., 249; P., 1900, 209.

chloride, action of solar radiations on, in presence of hydrogen (JOUNIAUX), A., ii, 506.

reduction of, by hydrogen and the inverse reaction (JOUNIAUX; BERTHELOT), A., ii, 448.

iodide, formation of two kinds of mixed crystals of mercuric iodide and (ROOZEBOOM), A., ii, 20.

nitrate, alcoholic, action of, on aromatic bases (VAUDEL), A., i, 691.

action of, on ethyl iodide (v. BIRON), A., i, 111.

action of hydrogen peroxide and sodium carbonate on (v. BAEYER and VILLIGER), A., ii, 654.

interaction of, with disodium phosphate (BERTHELOT), A., ii, 503.

nitrite, action of, on aromatic halogen-substituted compounds (ZNATOWICZ), A., i, 319.

action of ethyl bromoacetate on (SCHOLL and SCHÖFER), A., i, 359.

oxide, basic energy of, in solution (LEVI), A., ii, 654.

dry, and ethyl iodide, action of, on benzoylacetate ester, deoxybenzoin and benzyl cyanide (LANDER), P., 1901, 59.

action of hydrogen peroxide on (v. BAEYER and VILLIGER), A., ii, 315, 654; (BERTHELOT), A., ii, 383.

gold tellurides from Colorado (PALACHE), A., ii, 109.

from Coolgardie, Western Australia (KRUSCH), A., ii, 393; (CARNOT), A., ii, 515.

from Cripple Creek and Coolgardie (RICKARD), A., ii, 663.

Silver organic compounds :—

Silver salts, compounds of, with aromatic amines and with pyridine (TOMBECK), A., i, 135, 164.

- Silver cyanide**, estimation and separation of copper cyanide and (BRUNCK), A., ii, 478.
- dibromo-, dichloro- and diiodo-platinicyanide* (MIOLATI and BELLUCCI), A., ii, 246.
- thiocyanate* in analysis (VAN NAME), A., ii, 130.
- Silver, estimation and separation of** :—
sources of loss in the estimation of, in copper bars, and a method for its avoidance (VAN LIEW) A., ii, 41.
- estimation of, in surgical dressings (FRERICHS), A., ii, 204.
- estimation of, in ores containing sulphur (HOLLARD), A., ii, 578.
- estimation of, in pyrites (BUDDÉUS; LOEYV), A., ii, 133.
- separation of, electrolytically (FULWEILER and SMITH), A., ii, 692.
- Silver and copper nuggets**, crystalline structure of (LIVERSIDGE), A., ii, 662.
- Sinapis alba*. See Agricultural Chemistry.
- Skin**, impermeability of, to hydrogen sulphide (CHAUVEAU and TISSOT), A., ii, 611.
- Skin activity** in obesity (SCHATTENFROH), A., ii, 174.
- in Europeans and Negroes (RUBNER), A., ii, 173.
- Slags, basic**, detection of fluorine and mineral phosphates in (v. LORENZ), A., ii, 193.
- value of the molybdate process when estimating the citrate-solubility of (FOERSTER), A., ii, 576.
- estimation of phosphoric acid in (PAPEZ), A., ii, 192.
- Smoke**, injury to trees by (SORAUER and RAMANN), A., ii, 36.
- Soap solutions** (SMITS), A., ii, 12.
- Soaps**, analysis of (BOHRISH), A., ii, 481.
- estimation of fatty acids in (BAUD), A., ii, 358.
- Sodamide**, action of iodine and liquid ammonia on (RUFF), A., ii, 16.
- Sodammonium**, action of, on certain metalloids (HUGOR), A., ii, 18.
- Sodium salts**, combination of, with ammonia in aqueous solution (DAWSON and McCRAE), T., 499; P., 1901, 6.
- toxic action of, on plants (COUPIN), A., ii, 122.
- Sodium telluriarsenate and telluriphosphate** (WEINLAND and PRAUSE), A., ii, 600.
- biborate (*borax*), distillation of, with methyl alcohol (POLENSKE), A., ii, 195.
- Sodium baborate** (*borax*), influence of, on metabolism in children (TUNNICLIFFE and ROSENHEIM; GRÜNBAUM), A., ii, 517.
- bromide and chloride, synthesis of; lecture experiment (ROSENFELD), A., ii, 547.
- and iodide, action of, on crops (VOELCKER), A., ii, 269.
- carbonate and hydrogen peroxide, action of, on silver nitrate (v. BAEYER and VILLIGER), A., ii, 654.
- hydrogen carbonate, and hydroxide, repelling of the ionisation of solutions of, by the addition of sodium chloride (SMITS and WOLFF), A., ii, 505.
- hydrogen carbonate, theory of the formation of, technically (BONLÄNDER and BREULL), A., ii, 383.
- copper carbonate (GRÜGER), A., ii, 240.
- chloride, determination of the decrease of vapour tension of a solution of, at higher temperatures (SMITS), A., ii, 304.
- poisonous effect of pure, on nerve-muscle preparations (CUSHING), A., ii, 671.
- influence of diet on the, in urine (MAUREL), A., ii, 565.
- diuretic effects of (THOMPSON), A., ii, 30.
- and sulphate, diuretic action of isotonic solutions of (MAGNUS), A., ii, 67.
- compound of, with uranyl chloride (ALOY), A., ii, 164.
- gold chloride, assay of (JOHNSON & SONS), A., ii, 350.
- chromate, new hydrate of (SALKOWSKI), A., ii, 514.
- chromates, solubility of, in water (DIETZ, FUNK, v. WROCHEM, and MVLIVUS), A., ii, 104.
- fluoride, influence of, on the action of seminae on the carbohydrates in the horny albumen of seeds (HÉRISSÉY), A., ii, 570.
- hydroxide and its hydrates, thermal properties of (DE FORCRAND), A., ii, 593.
- nitrate, absorption of water vapour by (BUSNIKOFF), A., ii, 59.
- decomposition of, by sulphuric acid (VOLNEY), A., ii, 600.
- See also Agricultural Chemistry.
- peroxide, properties of (JAUBERT), A., ii, 96; (DE FORCRAND), A., ii, 155.
- preparation and properties of hydrates of (JAUBERT), A., ii, 155.

Sodium :—

Disodium phosphate, interaction of, with silver nitrate (BERTHELOT), A., ii, 503.

Sodium sulphate, influence of, on the vapour pressure of aqueous ammonia solutions (PERMAN), T., 725; P., 1901, 47.

absorption of water vapour by (BUNNIKOFF), A., ii, 59.

solubility of mixtures of copper sulphate and (MASSOL and MALDÈS), A., ii, 594.

hydrate, $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$, spontaneous crystallisation of, from saturated solutions of the sulphate (DE COPPET), A., ii, 384.

and sodium potassium nitrilosulphates (DIVERS and HAGA), T., 1096; P., 1901, 164.

sulphide, action of, on potassium ferrocyanide (BERTHELOT), A., i, 20.

disulphide, reducing action of (BLANKSMA), A., i, 461.

substitutions and transformations effected by (BLANKSMA), A., i, 460.

polysulphides (BLANKSMA), A., i, 264.

thiosulphate, action of hydrogen peroxide on (NAB), A., ii, 16.

action of, on solutions of metallic salts at high temperatures and pressures (NORTON), A., ii, 624.

Sodium organic compounds :—

thiocyanate, action of heat on (GILES), A., i, 262.

Soils, analysis of (BERJU), A., ii, 193; (HAZARD), A., ii, 282; (STJOLEMA; MURRAY), A., ii, 350.

uniformity in (HALL), A., ii, 80.

estimation of readily soluble alkaline earths and their carbonates in (IMMENDORFF), A., ii, 130.

estimation of calcium in, by the citrate method (PASSON), A., ii, 347.

estimation of calcium oxide in (HOTTER), A., ii, 623.

estimation of clay in (PAGNOUL), A., ii, 283.

estimation of humus in (BIELER and ASÖ), A., ii, 709.

estimation of dry matter in (PUCHNER), A., ii, 479.

rapid estimation of nitrates in (MONTANARI), A., ii, 688.

estimation of phosphoric acid in (V. LORENZ), A., ii, 278; (GULLY), A., ii, 576.

estimation of potash in (RÜMPLER), A., ii, 196.

See also Agricultural Chemistry.

Solanine, formation of, in potatoes by Bacteria (WEIL), A., ii, 266.

Solanine, hydrolysis of (SCHULZ), A., i, 92.

hemolysis produced by (HÉDON), A., ii, 325.

Solidification point of fatty acids (MORESCHINI), A., ii, 48.

Solubility. See under Solution.

Solution, researches on (WYROUBOFF), A., ii, 149.

theory of (LEWIS), A., ii, 10; (JAV-MANN), A., ii, 89; (NERNST), A., ii, 647.

resorption of one, by another (OKER-BLOM), A., ii, 543.

velocity of. See Affinity.

Solubility, Etard's law of (COHEN and BÜCHNER), A., ii, 375.

and reaction velocity (BANCROFT), A., ii, 150.

and surface tension (HULETT), A., ii, 493.

relation between heat of solution and (CAMPETTI), A., ii, 642.

of acetylene and ethylene, comparison of the (TUCKER and MOODY), A., ii, 696.

of alkali chlorides and chlorates (WINTERER), A., ii, 96.

of alkalis in carbon tetrachloride (SCHINDELMEISER), A., i, 287.

of alums (LOCKE), A., ii, 656.

of barium sulphate in solutions of sodium thiosulphate (DOEBIN), A., ii, 348.

of cadmium fluoride (JAEGER), A., ii, 386.

of calcium and sodium chromates in water (DIETZ, FUNK, v. WROCHEM, and MYLIUS), A., ii, 104.

of lime in water at different temperatures (GUTHRIE), A., ii, 315.

of calcium oxalate (RICHARDS, McCaffrey, and BISEE), A., ii, 624.

of chlorine in aqueous hydrochloric acid (MELLOR), T., 225; P., 1900, 221.

of cobalt and nickel iodates and their hydrates in water (MEUSSER), A., ii, 555.

of mixtures of copper sulphate and sodium sulphate (MASSOL and MALDÈS), A., ii, 594.

of *n*-decanedicarboxylic acid (WALKER and LUMSDEN), T., 1202; P., 1901, 188.

of ethyl nitrate in water (v. BIRON), A., i, 111.

of gases in organic solvents (JUST), A., ii, 439.

in water (WINKLER), A., ii, 446.

of hydroxyazobenzene (FARMER), T., 865; P., 1901, 129.

- Solubility** of lead salts in water (V. ENDE), A., ii, 241.
 of manganous sulphate and its hydrates (COTTRELL), A., ii, 12; (RICHARDS and FRAPPIE), A., ii, 553.
 of mercury haloid salts and mercuric cyanide in organic solvents (SULC), A., ii, 101.
 of metallic hydroxides in ammonium and sodium salicylates (WOLFF), A., ii, 198.
 of neodymium chloride (MATIGNON), A., ii, 602.
 of red phosphorus in aqueous alcoholic potash (BURGESS and CHAPMAN), T., 1243; P., 1901, 190.
 of pigments in fats and soaps (NERKING), A., ii, 117.
 of precipitates containing heavy metals, electrochemical studies of the (IMMERWALD), A., ii, 301.
 of quartz in solutions of borax (SPEZIA), A., ii, 605.
 of salts (MYLIUS), A., ii, 550.
 of salts containing the same ion, influence of acids on the (ENKLAAR), A., ii, 494.
 of silver oxide (LEVI), A., ii, 654.
 of sodium hydrogen carbonate in sodium chloride solutions (BODLÄNDER and BREULL), A., i, 384.
 of theobromine (PAUL), A., i, 341.
 of tutin (EASTERFIELD and ASTON), T., 124.
 of uranium nitrate (OECHSNER DE CONINCK), A., ii, 104, 105, 164.
 of uranium sulphate (OECHSNER DE CONINCK), A., ii, 660.
 of uric acid in sulphuric acid (TAFEL), A., i, 236.
 in water and in mineral acids (HIS and PAUL), A., i, 131.
- Solutions**, action of heat on the absorption spectra and chemical constitution of saline (HARTLEY), A., ii, 53.
 thermochemistry of very dilute (v. STEINWEHR), A., ii, 641.
 specific heat of (PUSCHL), A., ii, 224.
 vapour tension of (PONSOR), A., ii, 593.
 which are not very dilute, determination of the decrease in vapour tension, and of the lowering of the freezing point of (SMITS), A., ii, 304, 436.
 degree of dissociation of dilute (TARUGI and BOMBARDINI), A., ii, 89.
 compressibility of (GUINCHANT), A., ii, 227.
 osmotic pressure of complex (JAKOWKIN), A., ii, 87.
 viscosity of mixtures of liquids and (LEES), A., ii, 148.
- Solutions**, colloidal. See Colloidal.
 solid, in ternary mixtures (BRUNI), A., ii, 11; (BRUNI and GORNI), A., ii, 150.
Supersaturation, distinction between chemical and physical, of liquids by gases (BERTHELOT), A., ii, 8.
- Solution pressure**, electrolytic (LEH-FELDT), A., ii, 4, 5; (KRÜGER), A., ii, 145.
- Solvent**, liquid nitrogen peroxide as a solvent (FRANKLAND and FARMER), T., 1356; P., 1901, 201.
- Solvents**, inorganic, and their dissociative power (WALDEN), A., ii, 11; (TOL-LOCZKO), A., ii, 437.
 influence of, on the rotation of optically active compounds (PATTERSON), T., 167, 477; P., 1900, 176; 1901, 40.
 influence of, on the rotation of ethereal dimethoxysuccinates and tartrates (PURDIE and BARBOUR), T., 971; P., 1901, 158.
 See also Cryosecopy.
- Soot**, mineral constituents of (HARTLEY and RAMAGE), A., ii, 399.
- Sorbic acid**, and its amide, anilide, chloride, nitrile and methyl ester (DOEBNER and WOLFF), A., i, 578.
- Soxhlet's apparatus**, modifications of (OSBORNE), A., ii, 136.
- Specific gravity**. See Density.
 heat. See Thermochemistry.
- Spectrum**. See Photochemistry.
- Spermase** from barley (GRÜSS), A., ii, 34.
- Sphaerocobaltite** from Libiola, Italy (FERRO), A., ii, 395.
- Spirillum desulfuricans* (BEYERINCK), A., ii, 120; (SALTET and STOCKVIS), A., ii, 265.
- Spirits**, detection of foreign colouring matter in (CRAMPTON and SIMONS), A., ii, 134.
 renatured, method for identifying (RAIKOW and SCHTARBANOFF), A., ii, 582.
 See also Brandy and Rum.
- Spleen**, occurrence of arginine in the (v. GULEWITSCH and JOCHELSON), A., ii, 29.
 proteolytic enzyme in the (HEDIN and ROWLAND), A., ii, 402.
 rôle of the, in trypsin formation (HERZEN; CAMPS and GLEY), A., ii, 324.
 metabolism in the dog before and after removal of the (NOËL-PATON), A., ii, 29.
- Spongio-melanoidin**, physiological action of (ROSENFELD), A., ii, 180.

- Spring water.** See under Water.
- Squammatic acid** from lichens (HESSE), A., i, 150.
- Stable manure.** See Agricultural Chemistry.
- Stannic and Stannous compounds.** See under Tin.
- Stannite**, crystallised, from Bolivia (SPENCER and PRIOR), A., ii, 392.
- Starch**, transitory, dependence of the production of, on temperature and on the action of oxydases (GRÜSS), A., ii, 33.
influence of variety of potatoes and manures on the quality of (GUFFROY), A., ii, 684.
estimation of, in potatoes (BAUMERT, BODE, and FEST), A., ii, 44; (BEHREND and WOLFS), A., ii, 536.
- Starch granules**, combined action of diastase and yeast on (MORRIS), T., 1085; P., 1901, 178.
- Starch preparation** used for confitures and creams, analysis of (FIEHSE), A., ii, 536.
- Starch-sugar**, detection of, in wine (DELLE), A., ii, 44.
- Steam** from saturated salt solutions, latent heat of evaporation of (TROXTON), A., ii, 592.
See also Water.
- Stearamide** (ORTON), T., 1356; P., 1901, 200.
- Stearic acid**, commercial, action of zinc powder on (HÉBERT), A., i, 251.
- Steel.** See under Iron.
- Stereochemistry** of nitrogen (SIMON), A., i, 49.
in the piperidine series (HOHENEMSER and WOLFFENSTEIN), A., i, 606; (MARCUSE and WOLFFENSTEIN), A., i, 608; (GROSCHUFF), A., i, 745.
- Stereoisomerides**, velocity of esterification and hydrolysis of (MARKWALD and MCKENZIE), A., ii, 229.
- Stereoisomerism** of the oximes, model of the nitrogen atom showing (WEDEKIND), A., ii, 596.
- Stibio-domeykite** from Lake Superior (KOENIG), A., ii, 109.
- Stibiotantalite** from Western Australia (SIMPSON), A., ii, 454.
- Stilbazole** (*styrylpyridine*), *o*-, *m*-, and *p*-nitro-, and their salts (FEIST), A., i, 290.
- Stilbene** (*s-diphenylethylene*) nitrosite and dinitrite (SCHMIDT), A., i, 266.
- Stilbene**, amino-, nitro-, and nitroamino-derivatives of, and their acetyl and halogen additive compounds (THIELE and ESCALFS), A., i, 689.
- Stilbene**, diamino- and dinitro- α -cyano-derivatives of (FREUND), A., i, 690.
 ω -dinitro- (SUDBOROUGH), P., 1901, 68.
isomeric (SCHMIDT), A., i, 266.
- isoStilbene** and bromo-, and dibromide (WISLICENUS and JAHREMARKT), A., i, 265.
- Stilbene-o-carboxylic acid**, ammonium and silver salts, dibromide, and dinitro-derivative and lactones of (LETTOLD), A., i, 711.
- Stillingia scifera**, fat and oil of the seeds of (TORTELLI and RUGGERI), A., ii, 34.
- Stoffertite** from the island of Mona, West Indies (KLEIN), A., ii, 558.
- Stomach**, fat-splitting enzyme of the (VOLHARD), A., ii, 518.
zymogens of the (GLAESSNER), A., ii, 666.
See also Digestion and Gastric juice.
- Strontianite** from Münster-Land (BEYKIRCH), A., ii, 247.
- Strontium borate** (OUVRARD), A., ii, 158.
nitrate, combination of, with ammonia in aqueous solution (DAWSON and McCRAE), T., 1069; P., 1901, 177.
sulphide, preparation and crystalline form of (MÜLLER), A., ii, 60.
- Strontium ferri-cyanides** (FISCHER and MÜLLER), A., i, 455.
- Strontium**, estimation of, as the oxalate (PETERS), A., ii, 692.
- Strychnine**, action of bromine on (KIPPENBERGER), A., ii, 52.
action of, on the spinal cord of rabbits (HARE), A., ii, 522.
compound of, with α -chlorohydrin, and base from (BIENENTHAL), A., i, 129.
use of, for the detection of bromates and chlorates (FAGES), A., ii, 191.
- Strychnine alkaloids**, reaction of, with perchloric acid (HAEUSSERMANN and SIGEL), A., ii, 124.
- 3-Styrenyl-1-methylhydroxytriazole** and its silver salt and acetyl derivative (YOUNG and OATES), T., 666; P., 1901, 86.
- Styrylitacenic acid** and its calcium salt (FICHTER and HIRSCH), A., i, 594.
- Subereneacetic acid**, and its methyl ester (WALLACE and VAN BEECK-VOLLENHOVEN), A., i, 156.
- Suberic diazomide** and dihydrazide and their derivatives (CURTIUS and CLEMM), A., i, 69.
- Suberyldihydroxamic acid** (ANGELICO and FANARA), A., i, 708.

Submaxillary gland. See Gland.

Substance ($C_2H_4S_2$) $_n$, from ethylene bromide and sodium disulphide (BLANKSMA), A., i, 461.

$C_3H_4ON_4S_2$, obtained in the preparation of canarin (GOLDBERG), A., i, 194.

$C_4H_2O_3N_4$, from the action of nitric acid on acetylene (TESTONI and MASCARELLI), A., i, 494.

$C_4H_5O_5N_3$, from the action of nitric acid on $C_{16}H_{26}O_{11}N_{12}S_3$ (V. VOGEL), A., i, 262.

$C_6H_2Br_6S_3$, and its derivatives, from the action of bromine on a chloroform solution of tetraethenyl hexa-sulphide (FROMM and MÄGLER), A., i, 184.

$C_6H_6O_6$, from *d*-tartaric acid and formaldehyde (ALBERDA VAN EKENSTEIN), A., i, 120.

$C_6H_6O_6N_2$, from the nitration of methyl butyrylacetacetates (BOUVÉAULT and BONGERT), A., i, 500.

$C_6H_8O_7$, from citric acid and formaldehyde (ALBERDA VAN EKENSTEIN), A., i, 120.

$C_6H_8O_4N$, from a mixture of nitric and sulphuric acids on ethyl crotonate (WAHL), A., i, 310.

$C_7H_7O_5N_3$, and its acetyl derivative, from the nitration of nitro-*p*-tolueneazoimide (ZINCKE and DROST), A., i, 73.

$C_7H_{10}O_4N_2$, from the oxidation of phellandrene nitrite (WALLACH and H. and E. LAUFFER), A., i, 89.

$C_8H_{11}O_8N_3$, from ammonia and ethyl cyanoethylacetonedicarboxylate (DÉRÔME), A., i, 313.

$C_9H_7O_9N$, from the action of light on *o*-nitrobenzaldehyde (CIAMICIAN and SILBER), A., i, 391, 543.

$C_9H_{10}O_3$, and its chloride, from 2-hydroxy-*m*-tolualdehyde (STOERMER and BEHN), A., i, 726.

C_9H_8O , from the action of sulphuric acid on the glycol from isobutaldehyde and isovaleraldehyde (LÖWY and WINTERSTEIN), A., i, 626.

$C_{10}HN_2Cl_{11}$, reactions of (SELL and DOOTSON), T., 899; P., 1901, 131.

$C_{10}HON_2Cl_7$, from the action of stannous chloride on $C_{10}HN_2Cl_{11}$, and of heat on $C_{10}HON_2Cl_9$ (SELL and DOOTSON), T., 905; P., 1901, 131.

$C_{10}HON_2Cl_9$, from the action of water, alcohol, or weak acids on $C_{10}HN_2Cl_{11}$ (SELL and DOOTSON), T., 902; P., 1901, 131.

Substance, $C_{10}HO_2N_2Cl_7$, from the action of sulphuric acid on $C_{10}HN_2Cl_7$ (SELL and DOOTSON), T., 903; P., 1901, 131.

$C_{10}H_7ON_3$, from the action of stannous chloride and hydrochloric and on the potassium salt of α - and β -nitroso- β - and α -naphthylamines (HARDEN and OKELI), P., 1900, 229.

$C_{10}H_8OBr_6$, from the bromination of menthone (v. BAEYER and SEITFERT), A., i, 216.

$C_{10}H_{11}O_2NBr$, from the oxidation of $C_{10}H_{17}O_2N_2Br$ (FORSTER), T., 657; P., 1901, 88.

$C_{10}H_{15}O_3N_2$, from ethyl $\beta\beta$ -diacetylpropionate and semicarbazide hydrochloride (MARCH), A., i, 312.

$C_{10}H_{16}O_2$, from the biological oxidation of fenchone (RIMINI), A., i, 394.

$C_{10}H_{16}O_2N_2$, and its salts, from the action of caustic soda on $C_{10}H_{17}O_2N_2Br$ (FORSTER), T., 658; P., 1901, 88.

$C_{10}H_{17}O_2N_2Br$, from the action of hydroxylamine on 1:1-bromonitrocamphane anhydrides (FORSTER), T., 654; P., 1901, 88.

$C_{10}H_{18}O_2N_6S_2$ and $C_{10}H_{20}O_4N_6Cl_2$, from the action of hydrogen sulphide and of hydrochloric acid on porphyrine (PILOTY and SCHWEIN), A., i, 518.

$C_{11}H_7O_2N_3$, from *o*-aminobenzaldehyde and barbituric acid (CONRAD and REINBACH), A., i, 410.

$C_{11}H_8O_4$, from bromomethylfurfural and sulphurous acid (FENTON and GOSTLING), T., 815; P., 1901, 119.

$C_{11}H_9O_5N_3$, from the action of alkalis on α -dinitrophenylpyridine (SPIEGEL and KATZENELLENBOGEN), A., i, 752.

$C_{11}H_{10}O_2N_2$, from the action of phenylhydrazine on isopyromucic acid (CHAVANNE), A., i, 649.

$C_{11}H_{12}O_6N$, from isopropylidenebis-tetronic acid and hydroxylamine hydrochloride (WOLFF and SCHIMPF), A., i, 284.

$C_{12}H_8O_2N_4$, from the action of nitric acid on anilopyrine (MICHAELIS and GUNKEL), A., i, 351.

$C_{12}H_{10}O_5$, and its silver compound and methyl derivative, from the auto-oxidation of anthragallol (BAMBERGER and PRAETORIUS), A., i, 730.

$C_{12}H_{13}O_2N_6Cl$, from methyl chlorocarbonate and pyridine (FARBEN-FABRIKEN VORM. F. BAYER & Co.), A., i, 662.

Substance, $C_{12}H_{15}O_8N$, from the interaction of ethyl bromoacetate and silver nitrate (SCHOLL and SCHÖFER), A., i, 359.

$C_{12}H_{16}O_4N_4$, from urethanophenyl-acetoxamidine and cyanic acid (LEHMANN), A., i, 276.

$C_{12}H_{20}N_4$, and its hydrochloride and platinumchloride, from acetonylacetone and hydrazine hydrate (GRAY), T., 682; P., 1901, 90.

$C_{12}H_{24}N_6$, from acetonylacetone and hydrazine hydrate (GRAY), T., 684; P., 1901, 90.

$C_{13}HNCl_6S_2$, from heating acridine with sulphur monochloride (EDINGER and ARNOLD), A., i, 753.

$C_{13}H_8O_2N_4Cl_2$, from the action of heat on 2-triazo-3:6-dichlorobenzaldehyde *p*-nitrophenylhydrazone (BAMBERGER and DEMUTH), A., i, 392.

$C_{13}H_{10}O_5N_2S$, from the oxidation of *p*-nitrobenzyl alcohol in presence of sulphanilic acid (WALTER), A., i, 694.

$C_{13}H_{12}O_4NS$, from salicylaldehyde and aniline sulphite solution (EIBNER), A., i, 378.

$C_{13}H_{16}O_5N_2$, from glucosamine and phenylcarbimide (STEUDEL), A., i, 674.

$C_{13}H_{18}O$, from the action of alcoholic potash on tiliadin (BRÄUTIGAM), A., i, 93.

$C_{14}H_2O_5Br_8$, from the action of glacial acetic acid on tetrabromo-*o*-quinone (JACKSON and KOCH), A., i, 598.

$C_{14}H_{11}O_5Br$, from the action of bromine on dimethyldihydrophthalide-tetronic acid (WOLFF and GABLER), A., i, 285.

$C_{14}H_{12}ON_2$, from the action of air and water on β -benzylhydroxylamine (BAMBERGER and SZOLAYSKI), A., i, 84.

$C_{15}H_{15}ONS$, from benzylideneaniline and thioacetic acid (EIBNER), A., i, 321.

$C_{15}H_{16}O_8$, from glyceraldehyde, phloroglucinol, and sulphuric acid (WOHL and NEUBERG), A., i, 12.

$C_{15}H_{19}O_5$, and its anilide, from phenylcarbimide and ethyl 2-cyclopentanecarboxylate (DIECKMANN), A., i, 539.

$C_{15}H_{26}O_2$, from ealamus oil (v. SODEN and ROJAHN), A., i, 395; (THOMS and BECKSTROEM), A., i, 396.

$C_{15}H_{20}O_3$, and its acetyl derivative, from isovaleraldehyde (LEDERER; ROSINGER), A., i, 669.

Substance, $C_{16}H_{10}O_3$, obtained in the synthesis of coumaranone (STOERMER and BARTSCH), A., i, 94.

$C_{16}H_{15}O_4N_2Cl_2P$, from malephenyl-amic acid and phosphorus oxychloride (VAN DORP and VAN HAARST), A., i, 137.

$C_{16}H_{17}O_{18}N_7Na_2$, from the action of sodium hydroxide on $C_{16}H_{26}O_{11}N_{12}S_3$ (v. VOGEL), A., i, 262.

$C_{16}H_{18}O_5N_2S$, from dimethylaniline, formaldehyde, sodium *p*-toluidine-sulphonate, and potassium dichromate (WALTER), A., i, 694.

$C_{16}H_{19}O_4$, from phenylcarbimide and ethyl 2-cyclohexanecarboxylate (DIECKMANN), A., i, 542.

$C_{16}H_{26}O$, obtained in the preparation of β -octylalcohol (MOUREU and DESMOTS), A., i, 443.

$C_{16}H_{26}O_{11}N_{12}S_3$, from the condensation of isodialuric acid with thiocarbamide (v. VOGEL), A., i, 262.

$C_{17}H_{14}ON_4$, from benzeneazopyrrole and phenylcarbimide (PLANCHER and SOXCINI), A., i, 432.

$C_{17}H_{16}N_2$, from benzaldehyde and phenylmethylpyrazoline (TRENER), A., i, 232.

$C_{17}H_{18}O_4N_2H_2O$, from the action of formaldehyde on methyl anthranilate (ERDMANN), A., i, 592.

$C_{18}H_{11}O_5N$, from the action of nitric acid on 2:5-dibenzoylfurfuran (PHELPS and HALE), A., i, 556.

$C_{18}H_{14}O_{10}$, from acetaldehyde and anhydrotetronic acid (WOLFF and GABLER), A., i, 285.

$C_{18}H_{15}ON$, from β -naphthol, formaldehyde, *p*-toluidine hydrochloride, and sodium chromate (WALTER), A., i, 694.

$C_{18}H_{17}N_3$, and its acetyl derivative, from the reduction of aminodiphenylimide (BÖRNSTEIN), A., i, 375.

$C_{18}H_{18}O_3$, and its bromo-derivative, from the iodination of phenol (VAUBEL), A., i, 143.

$C_{18}H_{18}O_4$, from the action of sulphuric acid on ethyl *m*-xylenediacetate (EPHRAIM), A., i, 688.

$C_{18}H_{26}O_4N_4$, from urethanophenyl-acetoxamidine and phenylcarbimide (LEHMANN), A., i, 276.

$C_{18}H_{26}O$, and its polyimide, from methyl nonyl ketone and benzaldehyde (CARETTE), A., i, 13, 127.

$C_{18}H_{36}O_2$, from the action of sulphuric acid on the glycol from isobutaldehyde and isovaleraldehyde (LÖWY and WINTERSTEIN), A., i, 626.

- Substance,** $C_{19}H_{18}ON_4$, from benzeneazo-2:4-dimethylpyrrole and phenylcarbimide (PLANCHER and SONCINI), A., i, 432.
- $C_{19}H_{18}N_2SO_2 \cdot \frac{1}{2}H_2O$, from heating benzylienedianiline anhydrosulphite with water (EIBNER), A., i, 378.
- $C_{19}H_{22}ON_4$, from β -camphornitrilamide, bromine, and sodium hydroxide (TIEMANN and TIGGES), A., i, 19.
- $C_{20}H_{15}O_3N$, from β -naphthol, furfuraldehyde, and ammonia (BETTI), A., i, 82.
- $C_{20}H_{15}N_3S$, from $\alpha\delta$ -diphenylsemithiocarbazine and benzaldehyde (BUSCH and HOLZMANN), A., i, 235.
- $C_{20}H_{18}ON_2S$, two (m. p. 145—150° and 141—142°), from diphenylformanidine and thiobenzoic acid, and phenylbenzenylamidine and thiobenzoic acid (WHEELER), A., i, 636.
- $C_{20}H_{22}O_7$, from Jamaica dog-wood (FREER and CLOVER), A., ii, 333.
- $C_{20}H_{27}ON$, from β -naphthol, valeraldehyde, and ammonia (BETTI), A., i, 82.
- $C_{20}H_{32}O_2$, or $C_{20}H_{34}O_2$, obtained in the preparation of fenchocarboxylic acid (WALLACH and v. WESTPHALEN), A., i, 331.
- $C_{21}H_{15}O_2Cl \cdot HCl$, from the action of hydrochloric acid on 7-hydroxy-2:4-diphenyl-1:4-benzopyranol hydrochloride (BÜLOW and v. SICHERER), A., i, 603.
- $C_{22}H_{13}O_6$, from Jamaica dog-wood (FREER and CLOVER), A., ii, 333.
- $C_{22}H_{15}O_4N_4$, from toluene and the phenylhydrazone of methyl formylphenylacetate (WISLIZENUS and BINDEMANN), A., i, 362.
- $C_{22}H_{28}O_6N$, from *o*-aminoacetophenone and ethyl oxalate (CAMPS), A., i, 751.
- $C_{23}H_{29}O_6N_4$, from the action of alcoholic sodium ethoxide on the condensation product of 2:3:4:5-tetraminotoluene and ethyl cetipate (THOMAS-MAMERT and STRIEBEL), A., i, 615.
- $C_{23}H_{32}O_7$, from Jamaica dog-wood (FREER and CLOVER), A., ii, 333.
- $C_{23}H_{21}O_2N_4Cl_2$, from antipyrine and carbonylchloride (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 662.
- $C_{23}H_{21}O_{12}N_3$, from *p*-nitrobenzamidine and ethyl oxalylacetate (RAFFERT), A., i, 569.
- Substance,** $C_{24}H_{17}ON_3$, from α -quinophthaline and phenylhydrazine (EIBNER and LANGE), A., i, 349.
- $C_{24}H_{18}O$, from the action of sodium ethoxide on acetophenone and ethyl malonate (STOBBE), A., i, 549.
- $C_{24}H_{18}O_3N_3Cl$, obtained in the preparation of aniline-black by Müller's method (BÖRNSTEIN), A., i, 400.
- $C_{24}H_{19}ON$, and its acetyl derivative, from β -naphthol, benzaldehyde, and ammonia (BETTI), A., i, 82.
- $C_{24}H_{36}N_2$, and its dinitrosoamine, and acyl and glyoxaline derivatives, from the reduction of isovaleraldehyde-*p*-toluidine (EIBNER and PURUCKER), A., i, 168.
- $C_{25}H_{32}O_2$, from Jamaica dog-wood (FREER and CLOVER), A., ii, 333.
- $C_{27}H_{18}O_2$, from salicylaldehyde and β -naphthol (ROGOFF), A., i, 152.
- $C_{27}H_{18}O_2$, from salol and the additive compound of pyridine and salol chlorocarbonate (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 662.
- $C_{27}H_{20}O$, from indene and cinnamaldehyde (THIELE), A., i, 76.
- $C_{27}H_{23}ON_2S$, from phenyl-*p*-tolylbenzenylamidine and thiobenzoic acid (WHEELER), A., i, 636.
- $C_{28}H_{18}O_2$, obtained in the preparation of nitroanthracene (DIMROTH), A., i, 198.
- $C_{28}H_{18}O_3$, from piperonaldehyde and β -naphthol (ROGOFF), A., i, 152.
- $C_{28}H_{19}O_7Br$, from the acetylation of $C_{13}H_9O_3Br$ (LIEBERMANN and LANSER), A., i, 466.
- $C_{28}H_{30}O_2$, from anisaldehyde and β -naphthol (ROGOFF), A., i, 152.
- $C_{28}H_{26}O_3$, from β -naphthol and vanillin (ROGOFF), A., i, 152.
- $C_{28}H_{20}O_4$, from the oxidation of tetraphenylcyclopentenolone (HENDERSON and CORSTORPHINE), T., 1261; P., 1901, 191.
- $C_{29}H_{22}ON_2$, from benzhydrol and benzeneazo- α -naphthol (MÖHLER and KEGEL), A., i, 56.
- $C_{29}H_{28}O_4$, obtained in the preparation of γ -phenacyl- γ -phenylpyrotartaric acid (STOBBE and RUSSWURM), A., i, 148.
- $C_{29}H_{32}O_{12}N_4$, from apiosedextrose-phloroglucinol and benzenediazonium chloride (VONGERICHTEN), A., i, 647.
- $C_{30}H_{21}O_2N_4Cl_2$, obtained in the preparation of aniline-black by Müller's method (BÖRNSTEIN), A., i, 400.

- Substance**, $C_{30}H_{22}O_2$, from the decomposition of β -methylantranol (LIMPRICHT), A., i, 145.
- $C_{30}H_{22}ON$, from β -naphthol, benzaldehyde, and aniline (BETTI), A., i, 82.
- $C_{30}H_{24}O$, from cuminaldehyde and β -naphthol (ROGOFF), A., i, 152.
- $C_{30}H_{52}O_2$, from the wax of the wild fig tree (GRESHOFF and SACK), A., i, 445.
- $C_{29}H_{60}O_6$, from agaric (ADRIAN and TRILLAT), A., i, 211.
- $C_{40}H_{62}O_{24}N_{10}$, from the action of nitrous acid on caoutchouc (HARRIES), A., i, 734.
- $C_{66}H_{54}O_2N_8$, and $C_{68}H_{66}O_4N_8$, from "Michler's hydrol" and diphenyl- and dianisyl-disazo- α -naphthol (MÖHLAU and KEGEL), A., i, 57.
- from lichens (HESSE), A., i, 85, 149; (ZOPF), A., i, 88, 547.
- from oil of lemons (BURGESS), P., 1901, 171; (THEILER), A., i, 218; (V. SODEN), A., i, 733.
- Substitution in phenol** (LAPWORTH), T., 1267.
- Succinaldehydoacetal** imino-ether (HARRIES), A., i, 452.
- Succinanil**, chloro- (VAN DORP and VAN HAARST), A., i, 138.
- Succindialdehyde** and its hydrate (HARRIES), A., i, 451, 633.
- Succindialdoxime** and its dibenzoyl and dimethoxy derivatives (HARRIES), A., i, 452.
- Succinic acid** (*ethanedicarboxylic acid*), condensation of, with furfuraldehyde (FICHTER and SCHEUERMANN), A., i, 479.
- detection of (NEUBERG), A., ii, 290.
- Succinic acid**, diethyl ester, addition of, to $\alpha\beta$ -unsaturated ketones and esters (STOBEE), A., i, 147, 276.
- 2:4-diiodophenyl ester (BRENANS), A., i, 643.
- Succinic acid**, halogen, action of ammonia and amines on (LITZ), A., i, 7.
- l-bromo-, action of hydrazine and phenylhydrazine on (LITZ), A., i, 9.
- iso***Succinic acid**. See Methylmalonic acid.
- Succinimidequinaldine** and its salts, and the action of hydrochloric acid on (EIBNER and LANGE), A., i, 350.
- Succinonitrile**, equilibrium in the system, water, ether, and (SCHREINEMAKERS), A., ii, 641.
- Succintetramethylacetal** (HARRIES), A., i, 633.
- and its hydrogen sulphite and bromophenylhydrazones (HARRIES), A., 451.
- "**Sucrase**," difficulty in the isolation of (SALKOWSKI), A., i, 180.
- Sucrose** (*cane sugar*; *saccharose*), presence of, in gentian root (BOURQUELOT and HÉRISSEY), A., ii, 34.
- presence of, in Panama wood (MEILLÈRE), A., ii, 185.
- occurrence of, in the fruit of *Paris quadrifolia* (KROMER), A., ii, 618.
- influence of temperature on the specific rotation of (SCHÖNROCK), A., ii, 287.
- measurement of the rotatory power of, its variation with temperature, and with the wave length of the light used (PELLAT), A., i, 672.
- density, expansion, and capillarity of aqueous solutions of (DOMKE, HARTING, and PLATO), A., i, 189.
- velocity of inversion of (V. LIPPMANN), A., ii, 89; (DUANE), A., ii, 440; (EULER), A., ii, 441.
- velocity of inversion of, in presence of methyl acetate (COPPADORO), A., ii, 544; (HENRI and BANCELS), A., ii, 647.
- influence of the nature and intensity of light on the inversion of, by mineral acids (GILLOT), A., i, 127.
- action of invert sugar on the inversion of (HENRI), A., i, 438.
- behaviour of aqueous solutions of, towards strontia at 125–128° (SCHÖNE and TOLLENS), A., i, 128.
- influence of, on the conductivities of solutions of potassium chloride, hydrogen chloride, and potassium hydroxide (MARTIN and MASSON), T., 707; P., 1901, 91.
- rapid estimation of, in beets (HILTNER and THATCHER), A., ii, 535.
- Scheibler's method for the estimation of, in beets (HERZFELD), A., ii, 426.
- estimation of, in condensed milk (S. H. R., and C. N. RIBER), A., ii, 355.
- Sugar** from the hydrolysis of filicitanic acid (REICH), A., i, 212.
- formation of, in liver cells (BLAL), A., ii, 608.
- nature of the, in blood, muscle, and urine (PAVY and STARR), A., ii, 257.
- quantity of, formed, after feeding with various proteids (BENDIX), A., ii, 258, 563.
- effects of the increased consumption of (V. BUNGE), A., ii, 458.
- as food for cattle (LEHMANN), A., ii, 415.
- as food for pigs (KLEIN), A., ii, 416.
- Sugar formation** from fat (HARTOGH and SCHUMM), A., ii, 176.

- Sugar, invert**, action of, on the inversion of sucrose by sucrase (HENRI), A., i, 438.
 estimation of, volumetrically (STOLLE), A., ii, 286.
- Sugars** from cellulose (FENTON), P., 1901, 166.
 search for, in the products of the hydrolysis of wood of trees (STORER), A., i, 67.
 fermentation of, by *Bacillus coli communis* and allied organisms (HARDEN), A., ii, 410.
 fermentation experiments with various yeasts and (LINDNER), A., ii, 182, 263.
 glycolytic decomposition of, in blood (PORTIER), A., ii, 116.
 carbamide derivatives of (SCHOORL), A., i, 258.
 compounds of, with 2:3-diaminobenzoic acid (SCHILLING), A., i, 385.
 of the blood (LÉPINE and BOULUD), A., ii, 610.
 new reaction of (SOLLMANN), A., ii, 535.
 colour reactions of (NEUBERG), A., ii, 286.
 detection of amino-derivatives of (STEUDEL), A., i, 674.
 detection of, in urine (OFFER), A., ii, 354; (RIEGLER), A., ii, 426.
 Neumann's modification of Fischer's phenylhydrazine test for, in urine (MARGULIES), A., ii, 135.
 detection of glycurone and glycuronic acid in (NEUBERG), A., i, 66.
 estimation of, by Fehling's solution (UTZ), A., ii, 205; (SOLTSIEN), A., ii, 286.
 estimation of, by Kjeldahl's method (WOY), A., ii, 286.
 estimation of reducing, in blood (MEILLÈRE and CHAPELLE), A., ii, 354.
 estimation of, in swedes (COLLINS), A., ii, 583.
 estimation of, in urine (PATEIN), A., ii, 355.
 estimation of, in urine by Lehmann's method (GOETZEL-ALBERS), A., ii, 355.
 estimation of small amounts of, in urine (RAIMANN), A., ii, 582.
 estimation of, in vinous products (BERNARD), A., ii, 355.
 separation of glycuronic acid from (NEUBERG), A., i, 66.
- Sulphammonium**, preparation and properties of (MOISSAN), A., ii, 234.
- p*-**Sulphanilic acid**, acidimetric value of (MASSOL), A., i, 532.
- 5-Sulphanilino-7-methylnaphthaphenazonium-3-sulphonic acid**, 9-chloro- (KEHRMANN and MÜLLER), A., i, 419.
- 4-Sulphanilino-1:2-naphthaquinone-6-sulphonic acid**, sodium salt (KEHRMANN and MÜLLER), A., i, 420.
- 5-*p*-Sulphobenzeneazo-2-hydroxy-*m*-tolualdehyde**, sodium salt (BORSCHÉ and BOLSER), A., i, 573.
- o*-Sulphobenzoic acid**, preparation of (KRANNICH), A., i, 153.
p-nitro-, *s*-chloride, esters, sulphone-fluorescein, anilide and anil of (HENDERSON), A., i, 208.
- o*-Sulphobenzoic chlorides**, and *p*-nitro-, action of, on carbamide (HOLMES), A., i, 271.
 as a test for albumin in urine (PRAUM; ROCH), A., ii, 710.
- o*-Sulphomercuribenzoic acid** and its sodium salt (PESCT), A., i, 624.
- Sulphones**, aromatic, new synthesis of (ÜLLMANN and PASDERMAJIAN), A., i, 383.
- Sulphones**. See also:—
 Acetophenonedisulphone.
β-Amylsulphone- α -ethylsacrotonic acid.
β-Anthraquinonesulphone-*n*-heptylamide.
β-Anthraquinonesulphonemethylanilide.
 Benzalsultim.
 7-Benzenesulphonoxycoumarone-4-carboxylic acid.
 Benzophenonedisulphone.
 Benzyltolylbenzenesulphonamide.
β-Diamylsulphonebutyric acid.
β-Diamylsulphone- α -mono- and -diethylbutyric acids.
β-Diamylsulphone- α -mono- and -dimethylbutyric acids.
 γ -Diamylsulphonevaleric acid.
β-Dibenzylsulphonebutyric acid.
β-Dibenzylsulphone- α -mono- and -diethylbutyric acids.
β-Dibenzylsulphone- α -mono- and -dimethylbutyric acids.
 γ -Dibenzylsulphonevaleric acid.
β-Diethylsulphone- α -diethylbutyric acid.
β-Diethylsulphone- α -dimethylbutyric acid.
 Diethylsulphonediphenylmethane.
ββ-Diethylsulphone- γ - and - δ -methylpentane- δ - and - γ -ones.
ββ-Diethylsulphonepentane- γ -one.
 Diethylsulphone- α -phenylethane.
 α -Dihydroxydiphenylsulphone.
 Dinaphthylsulphonebisdazo-diphenyl and -ditolyl.

Sulphones. See :—

- Diphenylsulphone.
- Diphenylsulphonebisdiazo-diphenyl and -ditolyl.
- β -Diphenylsulphone- α -ethylbutyric acid.
- β -Diphenylsulphone- α -methylbutyric acid.
- γ -Diphenylsulphonevaleric acid.
- Disulphones.
- Di-*p*-tolylidisulphone.
- Ditolylsulphonebisdiazo-diphenyl and -ditolyl.
- Di-*p*-tolylsulphonehydroxylamine.
- Di-*p*-tolylsulphonemethylamine.
- 2-Hydroxydiphenylsulphone.
- Methylsulphonetetrazole.
- β -Methyl- $\gamma\gamma\zeta\zeta$ -tetraethylsulphone-heptane.
- o*-Phenolsulphonebenzoic chloride.
- Phenyl-*p*-amino-*o*-tolylsulphone.
- α -Phenyl- γ -diethylsulphonebutane- α -one.
- Phenyl-*p*-nitro-*o*-tolylsulphone.
- o*-Phenylsulphonebenzoic acid.
- Phenyl-*o*-tolylsulphone.
- “Saccharin.”
- Tetraethyldisulphonetetrasulphide.
- $\beta\beta\gamma\gamma$ -Tetraethylsulphonebutane.
- $\beta\beta\epsilon\epsilon$ -Tetraethylsulphonehexane.
- $\beta\beta\delta\delta$ -Tetraethylsulphonepentane.
- p*-Tolylaminophenylsulphone.
- p*-Tolylsulphonedii- β -naphthoxyethylamide.
- p*-Tolylsulphonecarbinol.
- p*-Tolylsulphonecarbinylaniline.
- p*-Tolylsulphonehydroxylamine.
- cyclo-o*-Xylylene-1:3-disulphone-2-dimethylmethylenes.
- cyclo-o*-Xylylene-1:3-disulphone-2-phenylmethylenes.
- Sulphonic acids**, isolation of, by vacuum distillation (KRAFFT and WILKE), A., i, 74.
- rate of hydrolysis of (CRAFTS), A., ii, 444.
- salts, compounds of, with hydrogen fluoride (WEINLAND and KAPPELLER), A., i, 309.
- Sulphonic chlorides, aromatic**, action of, on carbamide (REMSEN and GARNER), A., i, 270.
- action of, on thiocarbamide (REMSEN and TURNER), A., i, 270.
- Sulphophenylglycine-1-carboxylic acids**, 4- and 5-, and their salts (VORLÄNDER and SCHUBART), A., i, 564.
- Sulphosalicylic acid** and its nitro-derivative (HIRSCH), A., i, 84.
- p*-**Sulphotolylaniline**, methine compound of (v. MEYER, NÄCKE, and GMEINER), A., i, 265.

- Sulphur**, irregular distribution of, in pig-iron (BOLLING), A., ii, 124.
- molecule, S_8 , dissociation of (BILTZ), A., ii, 649.
- Wöhler's blue or green, new mode of formation of (ORLOFF), A., ii, 499.
- action of ozone on (WEYL), A., ii, 311.
- loss of, in preparing ash of plants (FRAPS), A., ii, 421.
- Sulphur compounds**, action of ozone on (WEYL), A., ii, 311.
- Sulphur monochloride**, action of, on anthracene (LIPPMANN and POLLAK), A., i, 690.
- Thionyl chloride**, action of lead cyanate on (DIXON), T., 551 ; P., 1901, 51.
- use of, for the preparation of chlorides of organic acids (MEYER), A., i, 628.
- Sulphuryl chloride**, hydrate of (v. BAEYER and VILLIGER), A., ii, 311; (CARRARA), A., ii, 549.
- Sulphur perfluoride**, action of the silent electric discharge on (BERTHELOT), A., ii, 15.
- Sulphuryl fluoride**, preparation and properties of (MOISSAN and LEBEAU), A., ii, 233.
- dioxide, latent heat of evaporation of (CROMPTON), P., 1901, 62.
- action of, on aqueous solutions of potassium ferro- and ferri-cyanide (MATUSCHKE), A., i, 635.
- trioxide and its dimeric form (ODDO), A., ii, 650.
- physical constants of (SCHENCK), A., ii, 380.
- Sulphurous acid**, estimation of, in wines (PATUREL), A., ii, 628.
- Sulphuric acid**, distribution of, in the atmosphere (OST), A., ii, 15.
- preparation of, for use in acidimetry (KÖHN), A., ii, 190 ; (MEADE), A., ii, 342.
- absorption of water vapour by (BUSNIKOFF), A., ii, 58, 496.
- depression of the freezing point in solutions containing hydrochloric acid and (BARNES), A., ii, 304.
- anhydrous, action of, on dry potassium persulphate (BACH), A., ii, 447.
- analysis of strong and fuming (RABE), A., ii, 473.
- detection of added, in wine (CARPENTIER), A., ii, 191.
- detection of selenium in (ORLOFF), A., ii, 192 ; (JOUVE), A., ii, 421.
- estimation of, in the presence of iron (KÜSTER and THIEL), A., ii, 124.

Sulphur:—

Sulphuric acid, estimation of, in waters (HARTLEY), A., ii, 627; (WINKLER), A., ii, 628.

Sulphates, relative bulk of weak aqueous solutions of certain, and their constituent water (PASEA), A., ii, 227.

reduction of, by Bacteria (BEYERINCK), A., ii, 120; (SALTER and STOCKVIS), A., ii, 265.

Thiosulphates, action of hydrogen peroxide on (NABL), A., ii, 94.

Thiosulphate solution, standardisation of (PERRIN), A., ii, 474.

Persulphuric acids (v. BAeyer and VILLIGER), A., ii, 380.

See also Caro's acid.

Persulphates (NAMIAS), A., ii, 15.

Sulphur, detection and estimation of:— test for free (STOCK and BLIX), A., ii, 651.

estimation of, in acetylene and other combustible gases (EITNER and KEPPELER), A., ii, 689.

estimation of, in commercial benzene intended for enriching illuminating gas (IRWIN), A., ii, 473.

estimation of, in bitumen, coal, pyrites, roasted ores, &c. (PELLET), A., ii, 622.

estimation of, in iron and steel (NOYES and HELMER), A., ii, 687.

estimation of, in wrought iron and steel (AUCHY), A., ii, 420.

estimation of, in oils (JEAN), A., ii, 687.

estimation of, as sulphides, hydrosulphides, polysulphides, and thiosulphates in solutions and mineral waters (GAUTIER), A., ii, 277.

Sulphur-selenium-tellurium group, replacements in the (KRAFFT and STEINER), A., ii, 235.

Sumach, analysis of (SESTI), A., ii, 708.

Sunflower oil (WILEY), A., ii, 336; (JEAN), A., ii, 483.

plant. See Agricultural Chemistry.

Superphosphate. See under Phosphorus and Agricultural Chemistry.

Supersaturation. See under Solutions.

Suprarenal capsules, physiology of (STREHL and WEISS), A., ii, 612.

extracts, substances which lower blood-pressure in (LEVIN), A., ii, 256; (HUNT), A., ii, 259.

physiological action of (LANGLEY), A., ii, 673.

glands, active principle of the (ALDRICH), A., ii, 564.

complete removal of the (MOORE and PURINGTON), A., ii, 406.

Suprarenals, blood of animals deprived of their (LEVIN), A., ii, 256, 518.

Surface tension, connection between, and solubility (HULETT), A., ii, 493.

use of the method of counting drops for the measurement of (GUYE and PERROT), A., ii, 374.

of hydrogen (DEWAR), A., ii, 597.

of liquid air (GRUNMACH), A., ii, 646.

of liquid precipitates (QUINCKE), A., ii, 646.

of some essential oils (JEANCARD and SATIE), A., i, 394.

Sweat, composition of (CAMERER), A., ii, 459.

human, cryoscopy of (ARDIN-DELTEIL), A., ii, 67.

Swedes. See Agricultural Chemistry.

Sylvanite from Colorado (PALACHE), A., ii, 109.

from Western Australia (KRUSCH), A., ii, 393.

See also Tellurides.

Synchysite from Narsarsuk, South Greenland (FLINK), A., ii, 663.

Syngenite, formation of, at 25° (VAN'T HOFF and WILSON), A., ii, 249.

Syntonins, albumins, albumoses, and peptones of muscular tissue, differentiation between (BILTÉRYST), A., ii, 632.

T.

Taka-diastrase, action of, on starch solutions, and reversed ferment action (HILL), P., 1901, 184.

Tan liquor, estimation of tannic acid, organic and mineral acids in (JEAN), A., ii, 294.

Tannase (FERNBACH; POTTEVIN), A., i, 179.

Tannic acid, use of, for the estimation of alkaloids in chemico-toxicological analysis (KIPPENBERGER), A., ii, 79.

Tannin from *Cultha edulis* (BEITTER), A., ii, 268.

of elder tree bark (MALMÉJAC), A., ii, 572.

$C_{21}H_{20}O_{10}$, and its bromo-, acetyl-, and benzoyl derivatives from *Sequoia gigantea* (HEYL), A., i, 648.

estimations, new (SPECHT and LORENZ), A., ii, 294.

Tanning materials, analysis of (SESTI; SPICA), A., ii, 708.

Tannoform, $CH_2(C_{21}H_{19}O_{10})_2$ (HEYL), A., i, 648.

d-Tartaric acid, action of formaldehyde on (ALBERDA VAN EKENSTEIN), A., i, 120.

- d*-Tartaric acid, conversion of, into oxalacetic acid (WOHL and OESTERLIN), A., i, 365.
and citric acid, best tests for (PARIS), A., ii, 206.
estimation of, in presence of oxalic acid (PALLADINI), A., ii, 135.
- d*-Tartaric acid, salts, influence of molybdates and tartrates on the specific rotation of (ITZIG), A., i, 448.
potassium hydrogen salt (*cream of tartar*), analysis of commercial (QUANTIN), A., ii, 584.
titanium salts (ROSENHEIM and SCHÜTTE), A., ii, 246.
- d*-Tartaric acid, esters, influence of solvents on the rotation of (PURDIE and BARBOUR), T., 971; P., 1901, 158.
ethyl ester, influence of solvents on the rotation of (PATTERSON), T., 167, 477; P., 1900, 176; 1901, 40.
molecular-solution-volume of (PATTERSON), T., 214, 482; P., 1900, 177; 1901, 41.
ethyl *sec*-octyl ester and its dibenzoyl and diacetyl derivatives (McCRAE), T., 1103; P., 1901, 186.
methyl and ethyl esters, preparation of, and rotation of the methyl ester (PATTERSON and DICKINSON), T., 280; P., 1901, 4.
Racemic acid, rubidium salt (WYROUBOFF), A., i, 666.
- Tautocinchonine. See under Cinchonine.
- Tautomeric phenomena, explanation of (RABE), A., i, 33.
- Tautomerism of metallic derivatives of organic amides (TITHERLEY), T., 407; P., 1901, 31.
of *o*-benzoylbenzoic acid (HALLER and GUYOT), A., i, 146.
of phloroglucinol ethers, influence of the substituting radicles on the (KAUFLEDER), A., i, 207.
occurring amongst the thiocyanates of electro-negative radicles (DIXON), T., 541; P., 1901, 50.
- Tea, black, rôle of oxydase in the preparation of (ASO), A., ii, 679.
leaves, localisation of caffeine in (SUZUKI), A., ii, 680.
- Tecomin, the colouring matter of *Bignonia Tecoma* (LEE), T., 284; P., 1901, 4.
- Tellurium from Hannan's district, Western Australia (MACIVOR), A., ii, 167.
atomic weight of (STEINER), A., ii, 236.
- Tellurium, preparation of large quantities of (MATTHEY), A., ii, 447.
refractive power of, in its compounds (PELLINI and MENIN), A., ii, 94.
- Tellurium compounds, physiological and toxicological effects of (MEAD and GILES), A., ii, 261.
- Tellurium caesium fluoride (WELLS and WILLIS), A., ii, 652.
hydride. See Hydrogen telluride.
- Tellurides from Colorado (PALACHE), A., ii, 109.
from Cripple Creek and Coolgardie (RICKARD), A., ii, 663.
from Western Australia (KRUSCH), A., ii, 393; (CARNOT), A., ii, 515.
See also Calaverite, Coolgardite, Petzite, and Sylvanite.
- Telluric acid (GUTBIER), A., ii, 501; (MYLIUS), A., ii, 550.
crystalline form of (BRUNCK), A., ii, 649.
compounds of, with arsenates, iodates, and phosphates (WEINLAND and PRAUSE), A., ii, 599.
- allo*Telluric acid (MYLIUS), A., ii, 550.
- Tellurium aromatic compounds (ROHRBAECH), A., i, 273.
- Ditelluro-anisyl trisulphide and -phenetyl tri- and penta-sulphides (ROHRBAECH), A., i, 273.
- Telluroacetylcumene, *dichloro*- (ROHRBAECH), A., i, 274.
- p*-Telluro-anisole and -phenetole (ROHRBAECH), A., i, 273.
- Telluromethyl ψ -cumyl, α -naphthyl, *p*-phenetyl, and xylol ketones, *dichloro*- (ROHRBAECH), A., i, 274.
- Tellurium, estimation of, gravimetrically (GUTBIER), A., ii, 687.
- Tellurium-sulphur-selenium group, replacements in the (KRAFFT and STEINER), A., ii, 235.
- Temperature. See Thermochemistry.
- Termierite from Miramont (FRIEDEL), A., ii, 397.
- $\Delta^{1,4}$ -Terpadiene-3-oxime-6-one (*nitroso-thymol*) (KREMER and BRANDEL), A., i, 729.
- Terpene, $C_{11}H_{17}$, from pulegone and magnesium methiodide (GRIGNARD), A., i, 681.
- Terpenes from cascarilla oil (FENDLER), A., i, 219.
from sandarac resins (HENRY), T., 1149; P., 1901, 187.
action of Denigès' acetone reagent on (GLÜCKSMANN), A., ii, 202.
- Terpene series, elimination of water, halogen hydride, and ammonia in the (SEMMLER), A., i, 330.

- Terpenoid compounds, genesis of, in plants (CHARABOT), A., ii, 34.
role of the chlorophyll function in the genesis of, in plants (CHARABOT), A., ii, 183.
 formation of, in the geranium (CHARABOT), A., i, 38.
- Terpenylic acid (PERKIN), P., 1900, 215.
- Terpinene and Terpineneoxideoxime and its isomeride (SEMMLER), A., i, 331.
- Terpineol, new preparation of (GENVERRESSE), A., i, 280.
- l*-Terpineol and its derivatives (SCHIMMEL & Co.), A., i, 395.
- Tetanus poison, chemical nature of the (HAYASHI), A., i, 354.
 toxin and antitoxin, injection of, into the sub-arachnoid space (RANSOM), A., ii, 118.
- Tetracetoxydiphenylene oxide (BREZINA), A., i, 701.
- Tetracetyl bromodextrose (FISCHER and ARMSTRONG), A., i, 257; (COLLEY), A., i, 671.
- Tetracetylchloro-dextrose and -galactose (FISCHER and ARMSTRONG), A., i, 257.
- Tetracetyl- β -methylgalactoside (KÖENIGS and KNORR), A., i, 370.
- Tetracetyl- α -methylglucoside (FISCHER and ARMSTRONG), A., i, 257.
- Tetracetyl- α - and - β -methyl- and - β -ethyl-glucosides (KÖENIGS and KNORR), A., i, 370.
- Tetracetyl- β -phenylglucoside and - β -naphthylglucoside (FISCHER and ARMSTRONG), A., i, 672.
- Tetracetyltetramethylene, *dithio*- (WENZEL), A., i, 403.
- Tetradecanaphthene, chloro- (MABERY and SIEPLEIN), A., i, 306.
- Tetradecoic anhydride (*myristic anhydride*) (KRAFFT and ROSINY), A., i, 113.
- Tetradecylacetylene, amino- and nitro-derivatives, *tetrabromide*, and metallic compounds of (KRAFFT and HEIZMANN), A., i, 110.
- Tetradecylacetylenecarboxylic acid (*tetradecylpropionic acid*) and its amide and benzoyl derivative, and Tetradecylacetylenesulphonic acid (KRAFFT and HEIZMANN), A., i, 110.
- Tetradecylbenzoylacetylene (KRAFFT and HEIZMANN), A., i, 110.
- Tetraethenyl *l*-cassulphide (*ethenyl-trisulphide*) and its derivatives, and Tetraethenyldisulphonetetrasulphide (FROMM and MÄGLER), A., i, 184.
- Tetraethyldiarsonium salts, and compounds of, with mercuric chloride (BIGINELLI), A., i, 20.
- Tetraethyldiacetydic acid, compound of, with potassium nitrate (BIGINELLI), A., i, 21.
- $\beta\beta\epsilon\epsilon$ -Tetraethylsulphonehexane and $\beta\beta\delta\delta$ -Tetraethylsulphonepentane (POSNER), A., i, 15.
- $\beta\beta\gamma\gamma$ -Tetraethyl-thiolbutane, and -sulphonebutane (POSNER), A., i, 15.
- Tetrahedrite from Mount Botes, Hungary (LOCZKA), A., ii, 247.
- Δ^1 -Tetrahydrobenzoic acid, ethyl ester, action of ethyl diazoacetate on (BRÄREN and BUCHNER), A., i, 85.
- Tetrahydrobenzylamine derivatives (FAREWERKEVORM. MEISTER, LUCIUS, and BRÜNING), A., i, 691.
- Tetrahydrodiphenylene oxide and its picrate (HÖNIGSCHMID), A., i, 700.
- Tetrahydronaphthalene, refraction and dispersion of (PELLINI), A., ii, 365.
- ac*-Tetrahydro- β -naphthylamine, resolution of (POPE and HARVEY), T., 75; P., 1900, 206.
- d-ac*-Tetrahydro- β -naphthylamine and its platnichloride, and benzoyl, acetyl, and benzylidene derivatives (POPE and HARVEY), T., 81; P., 1900, 206.
- d*- and *l-ac*-Tetrahydro- β -naphthylamines, and their *d*- and *l*-bromocamphorsulphonates, hydrochlorides and camphorsulphonates; and their racemisation (POPE and HARVEY), T., 75; P., 1900, 206.
- Tetrahydrophenanthrene, refraction and dispersion of (PELLINI), A., ii, 365.
- Tetrahydroisophthalic acid from tetrahydrotrimesic acid (LAWRENCE and PERKIN), P., 1901, 47.
- Tetrahydropyridine and its aurichloride and benzoyl derivative (PAAL and HUBALECK), A., i, 745.
- Tetrahydroquinoliniumiodoacetic acid, methyl ester (WEDEKIND), A., i, 640.
- Tetrahydroquinolylacetic acid, methyl and ethyl esters (WEDEKIND), A., i, 640.
- Tetrahydrothiophentetracarboxylic acid and dinitrile, *dithio*-, ethyl esters (WENZEL), A., i, 402.
- Tetrahydrouric acid (TAFEL), A., i, 237, 427.
- Tetrahydroxyanthraquinone-3-6-disulphonic acid, 1:8-diamino-2:4:5:7- (FARBENFABRIKEN VORM. F. BAYER & Co.), A., i, 729.
- Tetrahydro-xylic acid and its *di*bromo-, and methyl esters, and anilide (LEES and PERKIN), T., 350; P., 1900, 20.
- Tetrahydro-xylic acids, stereoisomeric (PERKIN and YATES), T., 1879.
- Tetrahydroxymethylantraquinone (SEEL), A., i, 92.

- Tetraketohyridacenedicarboxylic acid**, ethyl ester and its sodium salt (EPHRAIM), A., i, 688.
- 2:4:6:4'-Tetramethoxybenzoylacetophenone**, *isonitroso-* (DILLER and V. KOSTANECKI), A., i, 476.
- 3:4:3':4'-Tetramethoxydiphenyltri-chloroethane** (FEUERSTEIN), A., i, 274.
- 2:4:6:3'-Tetramethoxy-4'-ethoxybenzoylacetophenone** and its *isonitroso-*derivative (DILLER and V. KOSTANECKI), A., i, 476.
- 3:4:3':4'-Tetramethoxystilbene** (FEUERSTEIN), A., i, 274.
- Tetramethyldiaminocycloheptene** (WILLSTÄTTER), A., i, 224.
- Tetramethyldiaminophenyl-anthranol** and -oxanthranol (HALLER and GUYOT), A., i, 350.
- 4:4'-Tetramethyldiaminotriphenylcarbinol**, ethers of (FISCHER), A., i, 82.
- Tetramethylene glycol**. See *αδ*-Butanediol.
- Tetramethylenecarbinol**, preparation and physical properties of (PERKIN), T., 329; P., 1901, 33.
- 3:4-cycloTetramethylene-5-pyrazolone**. See 2-Ketohexahydroindazole.
- Tetramethylenetetracarboxylic acid**, *dithio-*, and its ethyl ester and salts (WENZEL), A., i, 402.
- 1:2-cycloTetramethyleneumbelliferone** (DIECKMANN), A., i, 542.
- Tetramethylenylmethylamine**. See Methylcyclobutane, *ω*-amino-.
- s-Tetramethyldinitroazoxymethane** (SCHÜFER), A., i, 495.
- Tetramethylpurone** (TAFEL), A., i, 238.
- 2:2:5:5-Tetramethyl-pyrrolidine** and -pyrrolidine, and 3-amino-derivative of the pyrrolidine (PAULY and SCHAUM), A., i, 607.
- 1:2:4:5-Tetraphenylhexahydro-1:2:4:5-tetrazine** (RASSOW; RASSOW and LUMMERZHEIM), A., i, 777.
- 1:2:4:5-Tetraphenylcyclopentene** and its chloro-derivative and **1:2:4:5-Tetraphenylcyclopentane** (HENDERSON and CORSTORPHINE), T., 1263; P., 1901, 191.
- Tetraphenylcyclopentenol** and its acetyl and bromo-derivatives (HENDERSON and CORSTORPHINE), T., 1261; P., 1901, 191.
- Tetraphenylcyclopentenolone**, and its oxime, *p*-bromophenylhydrazone, and acetyl derivative, and the action of bromine, phosphorus pentachloride, and alcoholic hydrogen chloride on, and oxidation of (HENDERSON and CORSTORPHINE), T., 1258; P., 1901, 190.
- Tetraphenylphenylenediamines** (HAEUSERMANN), A., i, 229.
- $\alpha\beta\gamma\delta$ -Tetraphenylpiperazine** and its salts, synthesis of (SCHMIDT), A., i, 266, 295.
- Tetraphenyltetrazoline** and α - and β -*dinitro-* (BAMBERGER and GROB), A., i, 296.
- Tetrazoditolyldisulphonic acid**, sodium salt, combination of, with β -naphthylethylamine (SEYEWITZ and BLANC), A., i, 621.
- Tetrazole-thiol**, and -sulphonic acid, and **Tetrazolol** and their salts (FREUND and PARADIES), A., i, 771.
- Tetronic acid**, condensation products of (WOLFF), A., i, 283.
- Thallium rhodium alum** (PICCINI and MARINO), A., ii, 392.
- Thallium chlorobromides** (THOMAS), A., ii, 60, 100, 159, 507.
- iodide and nitrate, formation of mixed crystals of (VAN EIJCK), A., ii, 19.
- Thallic thallous** i nitrate (WELLS, BEARDSLEY, JAMIESON, and METZGER), A., ii, 653.
- Thallium**, estimation of, volumetrically (MARSHALL), A., ii, 196.
- Thamnolic acid** from lichens (HESSE), A., i, 150.
- Thebenidine** and its methiodide and platinichloride (VONGERICHTEN), A., i, 341.
- Theine**. See Caffeine.
- Thenardite**, formation of, from mirabilite (SCHEMTSCHUSCHNY and KURNAKOFF), A., ii, 605.
- Theobromine** and the salts it forms (PAUL), A., i, 341.
- synthesis of, from cyanoacetic acid (TRAUBE), A., i, 54.
- influence of, on the excretion of purine substances in urine (KRÜGER and SCHMID), A., ii, 463.
- Theophylline** (4:6-dimethylxanthine), synthesis of, from cyanoacetic acid (TRAUBE), A., i, 54.
- THERMOCHEMISTRY** :—
- of very dilute solutions (v. STEINWEHR), A., ii, 641.
- of the ammonio-aluminium chlorides (BAUD), A., ii, 161, 224, 303.
- of the hyper-acids of cerium, thorium, and zirconium (PISSARJEWSKY), A., ii, 56.
- Thermochemical researches** on the principal opium alkaloids (LEROY), A., ii, 6.
- Thermodynamical laws**, deductions based on (LEWIS), A., ii, 10, 639.
- observations (SAND), A., ii, 303.

THERMOCHEMISTRY :—

- Thermodynamical** potential, development of the, in terms of T and p in the case of compound components (VAN LAAR), A., ii, 224.
- Thermodynamics** of solutions of chlorine and hydrogen chloride in water (MELLOR), T., 235.
- Thermoelectric behaviour** of some oxides and metallic sulphides (VAN AUBEL), A., ii, 222.
- Heat**, action of, on the absorption spectra and chemical constitution of saline solutions (HARTLEY), A., ii, 53.
- Thermal capacity**, proposal regarding the definition of (RICHARDS), A., ii, 223.
- conductivity, and thermo-electric efficiency of some metals (JAEGER and DIESSELHORST), A., ii, 84.
- pressure, new conception of (LEWIS), A., ii, 10, 639.
- properties of *isopentane* compared with those of *n-pentane* (ROSE-INNES and YOUNG), A., ii, 644.
- Temperature**, influence of, on the dissociation of copper-ammonia sulphate (DAWSON and McCRAE), T., 1072; P., 1901, 178.
- influence of, on the velocity of reaction between ethyl alcohol and hydrochloric acid (PRICE), T., 303; P., 1900, 185.
- of liquids in relation to viscosity and chemical constitution (BATSCHINSKI), A., ii, 645.
- change of, attending the solidification of melted organic substances (PAWLEWSKI), A., ii, 85.
- influence of, on the specific rotation of sucrose (SCHÖNROCK), A., ii, 287.
- of the marmot (PEMBREY), A., ii, 608.
- lowering of, and loss of water in *Stentor* and *Spirogyra* (GREELEY), A., ii, 668.
- influence of, on the energy of the decomposition of proteid in germination (PRIANISCHNIKOFF), A., ii, 120.
- Temperature changes** of the specific volumes of liquid and saturated vapour, relation between the (VAN DER WAALS), A., ii, 305.
- Temperature coefficient** of the susceptibility of some salt solutions of the iron group (MOSLER), A., ii, 643.
- Critical constants**. See under Critical.

THERMOCHEMISTRY :—

- Critical state**, the (KANONNIKOFF), A., ii, 438.
- Thermometry**, accurate (MARCHIS), A., ii, 491.
- Thermometer**, air, at high temperatures (HOLBORN and DAY), A., ii, 84.
- Thermostat**, electrical (YOUNG), A., ii, 491.
- Heat conductivity** of some metals and non-metals (JAEGER and DIESSELHORST; RIETZSCH), A., ii, 84.
- Molecular heats** of compounds, and the law of Neumann-Joule-Kopp (VAN AUBEL), A., ii, 226.
- Specific heat** of alloys (MAZZOTTO), A., ii, 492.
- of some carbon compounds (LUGNIN), A., ii, 145.
- molecular, of dissociable gaseous compounds (PONSOT), A., ii, 84.
- of a gaseous mixture of compounds in chemical equilibrium (PONSOT), A., ii, 302.
- of metals, determination of the, by their rate of cooling (SERDOBINSKY and EMELIANOFF), A., ii, 303.
- of some organic nitrogenous compounds (KAHLENBERG), A., ii, 492.
- of solutions (PUSCHL), A., ii, 224.
- of aluminium ammonio-chloride, $Al_2Cl_6 \cdot 18NH_3$ (BAUD), A., ii, 303.
- of ethylene glycol (DE FORCRAND), A., ii, 224.
- of hydrogen (DEWAR), A., ii, 597.
- of molybdenum and tungsten (DEFAQZ and GUICHARD), A., ii, 659.
- of fats (VANDEVYVER-GRAU), A., ii, 46.
- Heat of dilution**, calculation of, according to Kirchhoff's formula (JÜTTNER), A., ii, 592.
- Heat of fermentation** of maltose (BROWN), A., ii, 304.
- Heat of formation** of electrolytes, calculated from their decomposition-potentials (GARRARD), A., ii, 55.
- Latent heat** of liquid and solid hydrogen (DEWAR), A., ii, 597.
- Latent heat of fusion** of antimony bromide and chloride (TOLLOCZKO), A., ii, 437.
- of some elements, calculation of the (DE FORCRAND), A., ii, 641.
- of ethylene glycol (DE FORCRAND), A., ii, 224.
- Temperature of ignition** of phosphorus (EYDMANN), A., ii, 312.

THERMOCHEMISTRY:—*Heat of combustion*=*c.*; *of formation*=*f.*; *of hydration*=*h.*; *of neutralisation*=*n.*; *of oxidation*=*o.*; *of substitution*=*sb.*; *of vaporisation*=*v.*

Heat of substitution of oxygen for sulphur in alkyl mercaptans and sulphides (BERTHELOT), A., ii, 147.

Latent heat of vaporisation of some carbon compounds (LUGININ), A., ii, 145.

of some elements, calculation of the (DE FORCRAND), A., ii, 641.

of liquids (CROMPTON), P., 1901, 61.

of some organic nitrogenous compounds (KAHLENBERG), A., ii, 492.

of steam from saturated salt solutions (TROUTON), A., ii, 592.

Thermochemical data of hydrochloric acid (*f.*) (AKUNOFF), A., ii, 82.

of some slightly soluble metallic salts (*f.*) (KLEIN), A., ii, 225.

of aluminium oxide and its hydrate (*f.*) (BERTHELOT), A., ii, 388.

on alloys of copper and zinc (*f.*) (BAKER), A., ii, 303.

of iron nitride (*f.*) (FOWLER and HARTOG), T., 299; P., 1900, 210.

of silver amalgams (*f.*) (BERTHELOT), A., ii, 156.

of acetals and their isomerides (*f.*) (DELÉPINE), A., i, 314.

of acetals of monohydric alcohols (*c.* and *f.*) (DELÉPINE), A., ii, 6.

of alkyl mercaptans and sulphide (*c.* and *f.*) (BERTHELOT), A., ii, 146.

of monosubstituted benzoic acids (*f.*) (MASSOL), A., i, 323.

of *o*- and *p*-bromobenzoic acids (*n.*) and of the sodium salts (*f.*) (MASSOL), A., i, 323.

of *o*-chlorobenzoic acid (*n.*) (MASSOL), A., ii, 226.

of sodium *o*-chloro- and *o*-iodobenzoate (*f.*) (MASSOL), A., ii, 226.

of chloroanilic acid (*c.*, *f.*, *sb.*) (VALEUR), A., i, 154.

of ethylene glycol (*h.* and *v.*) (DE FORCRAND), A., i, 307.

of ethylene glycol formal and acetal, *i*-erythritol diformal and diacetal, and *d*-mannitol triformal and triacetal (*c.* and *f.*) (DELÉPINE), A., i, 4.

of chloro-derivatives of quinol and quinone (*c.*, *f.*, *o.*, *sb.*) (VALEUR), A., i, 155.

of *p*-sulphanilic acid (*f.*, *h.*, *n.*) (MASSOL), A., i, 532.

of celluloses (*c.*) (VIGNON), A., i, 16.

Thermochemical data of glucosides (*c.* and *f.*) (FISCHER and V. LOEBEN), A., ii, 225.

of oils (*c.*) (SHERMAN and SNELL), A., ii, 430.

Heat of solution (HOLSBOER), A., ii, 226.

relation between solubility and (CAMPETTI), A., ii, 642.

determination of (COHEN), A., ii, 147.

of the ammonio-aluminium chlorides (BAUD), A., ii, 224.

of cadmium sulphate (HOLSBOER), A., ii, 226.

of neodymium chloride and its hydrates (MATIGNON), A., ii, 602.

of potassium hydroxide and its hydrates (DE FORCRAND), A., ii, 593.

of allotropic modifications of silver (BERTHELOT), A., ii, 156.

of sodium hydroxide and its hydrates (DE FORCRAND), A., ii, 593.

of thorium oxides in nitric acid (PISSARJEWSKY), A., ii, 56.

of uranium nitrate (OECHSNER DE CONINCK), A., ii, 105.

of *o*- and *p*-bromobenzoic acids (MASSOL), A., i, 323.

of *o*-chloro- and *o*-iodo-benzoic acids (MASSOL), A., ii, 226.

of resorcinol in ethyl alcohol (SPEYERS and ROSELL), A., ii, 147.

of *p*-sulphanilic acid (MASSOL), A., i, 532.

Thiocarbamide, condensation of, with isodialuric acid (V. VOGEL), A., i, 262.

action of aromatic sulphonic chlorides on (REMSEN and TURNER), A., i, 270.

Thiocarbamides, action of halogens on (HUGERSHOFF), A., i, 757.

Thiocarbimides, action of, on dithiocarbazine acids (BUSCH and WOLPERT), A., i, 233.

action of, on thiol acids (WHEELER and MERRIAM), A., i, 514.

d/**Thiocarbonic acid**, stereoisomerism of the hydrazones of the esters of (BUSCH), A., i, 430.

imino-, esters (DELÉPINE), A., i, 518.

Thiocyanic acid, esters, isomerism of (BERTHELOT), A., i, 203.

action of, on thiol acids (WHEELER and MERRIAM), A., i, 514.

mesityl and ω -*m*-xylyl esters (WHEELER and JOHNSON), A., i, 707.

Thiocyanic acid:—

Thiocyanates, action of reducing gases on (CONROY, HESLOP, and SHORES), A., i, 373.

yellow colouring matters from (GOLDBERG), A., i, 193, 516, 677.

of electro-negative radicles, tautomerism among (DIXON), T., 541; P., 1901, 50.

double, and the ferrie thiocyanate reaction (ROSENHEIM and COHN), A., i, 455.

Thiocyanogen and ψ -**Thiocyanogen** (GOLDBERG), A., i, 193, 516, 677.

Thioncarbamic esters, disubstituted, molecular rearrangement of (WHEELER and DUSTIN), A., i, 24.

Thionyl chloride. See under Sulphur. thiocyanate (DIXON), T., 551; P., 1901, 51.

Thio-oxyarsenic acids, preparation of (MCCAY), A., ii, 95; (WEINLAND and LEHMANN), A., ii, 313; (McLAUCHLAN), A., ii, 552.

Thiophenidene-aminothiazoles, *p*-bromoaniline, and *p*-toluidine (HANTZSCH and WITZ), A., i, 401.

Thiopyrine $\frac{2}{3}$ (*thioantipyrine*) and its hydrochloride and analogue (MICHAELIS and BINDEWALD), A., i, 52.

Thiosinamines, halogen-substituted (DIXON), T., 553; P., 1901, 49.

Thiosulphates. See under Sulphur.

Thiosulphonic acids of aromatic amines and *m*-diamines (CLAYTON ANILINE Co.), A., i, 694.

Thiourea-amidines (WHEELER), A., i, 487.

Thomsonite from Golden, Colorado (PATTON), A., ii, 455.

Thorium, chemistry of (BRAUNER), P., 1901, 67.

Thorium caesium chlorides (WELLS and WILLIS), A., ii, 660.

hydride and nitride, composition of (MATIGNON and DELÉPINE), A., ii, 106.

nitride (MATIGNON), A., ii, 61. *met*anitrade (KOHLSCHÜTTER), A., ii, 599.

double nitrates (MEYER and JACOBY), A., ii, 510.

thermochemistry of the hyper-acids of (PISSARJEWSKY), A., ii, 56.

Metathoric acid and **Metathorium-oxychloride** (STEVENS), A., ii, 391.

Metathorium oxides (STEVENS), A., ii, 391; (WYROUBOFF), A., ii, 604.

l-**Threose** and its oxazone and phenyl-benzylhydrazone (RUFF and KOHN), A., i, 449.

Thujene and, *iso***Thujene** (TSCHUGAEFF), A., i, 38, 601.

Thujoleacetic acid and its ethyl ester, and *iso***Thujoleacetic acid** (WALLACH and LEIMBACH), A., i, 157.

Thujonoxyglycuronic acid, potassium salt (HILDEBRANDT), A., ii, 181.

Thyme, oil of (JEANCARD and SATIE), A., i, 733.

Thymine, synthesis of (FISCHER and ROEDER), A., i, 294.

constitution of (STEUDEL), A., i, 108, 434.

Thymol, displacement of alkyl groups from, by nitration (LARTER), P., 1901, 183.

sodium derivative, action of ethyl chlorofumarate and of ethyl phenylpropionate on (RUHEMANN), T., 918; P., 1901, 155.

Thymol, *trinitro*-, acetyl, benzoyl, and ethyl derivatives, and phenylhydrazine salt of (MALDOTT), A., i, 80. nitroso-. See $\Delta^{1,4}$ -Terpadiene-3-oxime-6-one.

Thymoquinone and **Thymoquinol** in wild bergamot oil (BRANDELAND KREMERS), A., i, 598.

Thymoquinone, dibromo-, derivatives of (HOFFMANN), A., i, 473.

Thymoquinonebenzoyl- α -naphthylhydrazone (McPHERSON and GORE), A., i, 572.

Thymoquinonemalonic acid, bromo-, ethyl ester (HOFFMANN), A., i, 473.

β -Thymoxycinnamic acid, and its silver salt, and ethyl ester (RUHEMANN), T., 918; P., 1901, 155.

Thymoxyfumaric acid and its ethyl ester (RUHEMANN), T., 919; P., 1901, 155.

1-Thymoxymethylbenzoxazole (COHN), A., i, 752.

2-*m*-Thymoxymethyl-5-ethoxybenzimidazole and its salts (COHN), A., i, 352.

β -Thymoxystyrene (RUHEMANN), T., 919; P., 1901, 155.

Thymus and **Thyroid glands**. See under Gland.

Thyreo-globulin (OSWALD), A., ii, 461; (BLUM), A., ii, 671.

Tiglic acid. See **Pentenoic acid**.

Tiliadin from the bark of lime trees (BRÄUTIGAM), A., i, 93.

Tin from Western Australia (SIMPSON), A., ii, 454.

enantiotropy of (COHEN), A., ii, 106, 244.

Tin alloys with copper, results of chilling (HEYCOCK and NEVILLE), A., ii, 503.

with copper and with zinc, density of (MAEY), A., ii, 655.

- Tin salts**, studies on solutions of (YOUNG), A., ii, 318, 390, 603.
- Stannic bromide**, dissociating power of (TOLLOZKO), A., ii, 437.
- Stannous salts**, studies on solutions of (YOUNG), A., ii, 603.
- chloride, course and kinetics of the reaction between oxygen and (YOUNG), A., ii, 603.
- electrical conductivity of solutions of, and hydrochloric acid (YOUNG), A., ii, 318.
- oxidation of solutions of, by means of free oxygen (YOUNG), A., ii, 390.
- sulphide, action of potassium and sodium hydroxides on (PERKIN), A., ii, 479.
- Tin, estimation of** :—
- analysis of (MAINSBRECQ), A., ii, 41.
- precipitation of, from its sulpho-salts, and separation of, electrolytically, from antimony (OST and KLAPPROTH), A., ii, 695.
- detection of (SCHMATOLLA), A., ii, 580.
- estimation of, volumetrically, by means of stannous chloride (ZENGENIS), A., ii, 533.
- Tin-plated wares**, analysis of (MAINSBRECQ), A., ii, 41.
- Tissues**, chemical nature of (ÉTARD), A., ii, 563.
- chemico-physical relations of juices and (OKER-BLOM), A., ii, 326, 520.
- proteolytic enzymes in (HEDIN and ROWLAND), A., ii, 462.
- formation and decomposition of fat in the (HESTER), A., ii, 461.
- connective, silicic acid in (SCHULZ), A., ii, 257.
- elastic, composition of (VANDERGRIFT and GIES), A., ii, 461.
- nervous. See Nervous.
- Titaniferous iron ores**, separation of, in basis igneous rocks (VOGT), A., ii, 63, 319.
- Titanium**, quadrivalent, double compounds of (ROSENHEIM and SCHÜTTE), A., ii, 244.
- Titanium tetrachloride**, ammonio and pyridine salts of (ROSENHEIM and SCHÜTTE), A., ii, 245.
- sulphates (ROSENHEIM and SCHÜTTE), A., ii, 245.
- Titanic acid**, estimation of, colorimetrically (BRAKES), A., ii, 285.
- Tobacco**, new alkaloids from (PICTET and ROTSCHY), A., i, 339.
- estimation of nicotine in (TÓTH), A., ii, 363, 708.
- See also Cigar.
- (*Tolyl compounds Me = 1.*)
- Tobacco leaf**, occurrence of paraffins in (THORPE and HOLMES), T., 982; P., 1901, 170; (KISSLING), A., ii, 680.
- Tobacco plant**. See Agricultural Chemistry.
- p*-**Tolacrylidenebenzamidine** and its salts, phenylhydrazone, ethiodide and ethyl derivative (KUNCKELL and BAUER), A., i, 758.
- Tolane dinitrites**. See Stilbene, ω -dinitro-.
- p*-**Tolenylamidine**, and action of, on ketones (KUNCKELL and BAUER), A., i, 758, 759.
- Tolidine**, *oo*-dichloro- (Cl:Me:NH₂ = 2:3:4) and its hydrochloride and sulphate (COHN), A., i, 638.
- Toluene**, electrolytic oxidation of (MERZBACHER and SMITH), A., i, 134; (PULS), A., i, 318.
- bromination and iodination of (EDINGER and GOLDBERG), A., i, 22, 23.
- chlorination of (WYNNE), P., 1901, 116.
- chlorination of, in presence of the mercury-aluminium couple (COHEN and DAKIN), T., 1119; P., 1901, 91.
- oxidation of (BOEDTKER), A., i, 684.
- iodosulphurides, *o*- and *p*- (WEINLAND and STILLE), A., i, 684.
- Toluene**, six dichloro-derivatives, preparation, nitration, oxidation, and sulphonation of (COHEN and DAKIN), T., 1121; P., 1901, 91; (WYNNE), P., 1901, 116.
- 6-chloro-2:3-dinitro- (COHN), A., i, 637.
- o*-nitro-, dielectric constant of (TURNER), A., ii, 54.
- chlorination of (COHN), A., i, 637.
- o*- and *p*-nitro-, condensation of, with ethyl oxalate, and action of sodium ethoxide and amyl nitrite on (LAPWORTH), T., 1272; P., 1900, 109.
- o*-, *m*-, and *p*-nitro-, electrolytic oxidation of (PIERROX), A., i, 685.
- 2:4-dinitro-, condensation products of (THIELE and ESCALES), A., i, 689.
- ω -dinitro-, and its potassium and silver salts (PONZIO), A., i, 685.
- trinitro*-, additive compounds of, with α - and β -naphthylamine, and their acetyl derivative (SUDBOROUGH), T., 530; P., 1901, 44.
- 2:3- and 3:4-dinitroso-, nitro-derivatives of (ZINCKE and DROST), A., i, 73.
- Tolueneazodibromophenols** and their acetyl and benzoyl derivatives and ethyl ethers (HEWITT and TERVER), T., 1090; P., 1901, 172.

(*Tolyl compounds Me=1.*)

- p*-Tolueneazodiacetylsuccinic acid, diethyl ester (BÜLOW and SCHLESINGER), A., i, 98.
- Tolueneazoimides (*dirzotoluencimides*), *o*- and *p*-, nitro-derivatives of (ZINCKE and DROST), A., i, 73.
- Tolueneazo- β -naphthols, *o*- and *p*-, and their isomerides (BETTI and LEONCINI), A., i, 56.
- m*-Tolueneazo-*o*-nitrophenol and its ethyl ether (HEWITT and LINDFIELD), T., 157; P., 1900, 222.
- Tolueneazo-*o*-nitrophenols, *o*- and *p*-, and ethyl ethers and acetyl and benzoyl derivatives (HEWITT and LINDFIELD), T., 155; P., 1900, 222; discussion, P., 222.
- Tolueneazophenols, *o*-, *m*-, and *p*-, action of bromine on (HEWITT and TERVET), T., 1090; P., 1901, 172.
- p*-Tolueneazo-*p*-tolyl-auramine and -leucauramine (MÖHLAU and HEINZE), A., i, 433.
- Toluenediazoaminobenzoic acids, *o*-, *m*-, and *p*-, and their methyl esters (MEHNER), A., i, 471.
- p*-Toluenediazohydroxylaminobenzene (BAMBERGER), A., i, 171.
- p*-Toluenesulphinic acid (v. MEYER, NACKE, and GMEINER), A., i, 264.
action of, on nitrosobenzene (BAMBERGER and RISING), A., i, 201.
action of, on β -phenylhydroxylamine (BAMBERGER and RISING), A., i, 202.
- p*-Toluenesulphomorpholinamide (SAND), A., i, 741.
- Toluene-*p*-sulphonic acid, purification of (KRAFFT and WILKE), A., i, 74.
aminophenol, *o*- and *p*-amino- and *o*- and *p*-nitro-phenyl esters (BAMBERGER and RISING), A., i, 201.
- Toluene-*p*-sulphonic acid, and *o*-nitro-, esters and amides of (REVERDIN and CRÉPIEU), A., i, 686.
mono- and *di*-nitro-derivatives of (REVERDIN and CRÉPIEU), A., i, 685.
- Toluene- ω -sulphonic acid (*benzylsulphonic acid*), *m*-nitro-, and its salts, amide, chloride, and *m*-amino- (PURGOTTI and MONTI), A., i, 21.
- p*-Toluenethiolsulphonic acid, diazoaryl esters (TRÖGER and EWEES), A., i, 172.
- Toluic acids, *o*-, *m*-, and *p*-, and their methyl esters, chlorides, amides, and *mono*- and *di*-methylamides, action of nitric acid on (VAN SCHIERPENZEE), A., i, 592.
- o*-Toluic chloride and ω -chloro- (GOLDSCHMIDT), A., i, 709.

(*Tolyl compounds Me=1.*)

- o*-Toluidine, action of acetaldehyde on (EIBNER and PELTZER), A., i, 97.
action of methylenechlorohydrin on (GRASSI-CRISTALDI and SCHIAVOLENTI), A., i, 55.
- o*-Toluidine, 4-chloro- (COHN), A., i, 637.
6-chloro-, and its salts (COHN), A., i, 637.
- p*-Toluidine, new synthesis of (JAUBERT), A., i, 320.
action of chloroacetic acid on (STEPPE), A., i, 139.
oxidation of (BÖRNSTEIN), A., i, 375.
cyanoacetyl derivative of (GROTHE), A., i, 80.
- Toluidines, *o*- and *m*-, new method of preparing (SABATIER and SENDERENS), A., i, 638.
- Toluidines, *o*- and *p*-, acetylation of (SUDBOROUGH), T., 537; P., 1901, 45.
action of, on β -chloroallylthiocarbimide (DIXON), T., 558; P., 1901, 49.
interaction of, with phenylurethane (DIXON), T., 102; P., 1900, 207.
chloroacetyl, phenylsulphoneacetyl, *p*-tolylsulphoneacetyl, thiodiglycolyl, sulphonediacyl, and thio-cyanoacetyl derivatives of (GROTHE), A., i, 79, 80.
- Toluidines, *o*-, *m*-, and *p*-, action of acetylchloroamino-2:4-dichlorobenzene on (CHATTAWAY and ORTON), T., 465; P., 1901, 39.
- Toluidinoacetic acids, *o*- and *p*-, and the amide and nitrile of the *o*-acid (STEPPE), A., i, 139.
- p*-Toluidinoanilino-phosphoric acid, ethyl ester, and -phosphoryl chloride (CAVEN), P., 1901, 26.
- m*-Toluidinoazobenzoic acid, methyl ester (MEHNER), A., i, 471.
- o*-Toluidinodiacetic acid, oxidation of (VORLÄNDER and MUMME), A., i, 463.
action of nitrous acid on (VORLÄNDER and v. SCHILLING), A., i, 463.
- 4-*p*-Toluidino-1-phenylurazole, 5-thio- (BUSCH and GROHMANN), A., i, 617.
- p*-Toluidinophosphoryl chloride (CAVEN), P., 1901, 27.
- Toluidinopropionic acids, α -*o*- and α -*p*-, and the amide and nitrile of the α -*o*-acid (STEPPE), A., i, 140.
- 2-*p*-Toluidino-5-isopropyl-1:4-benzoquinone, 3:6-dibromo- (HOFFMANN), A., i, 474.
- p*-Toluidino-*p*-toluquinoneditolylimide, and the action of alcoholic sulphuric acid and ammonia on (BÖRNSTEIN), A., i, 376.

(*Tolyl compounds* $Mc=1$.)

5-*p*-Toluidino-7-*p*-tolynaphthaphenazonium 7-chloride, and 9 chloro- (KEHRMANN and KRAZLER), A., i, 420.

Toluo- γ -pyrones, *o*-, *m*-, and *p*-, and their carboxylic acids (RUHEMANN and BAUSOR), T., 472; P., 1901, 40.

Toluylbenzoic acid, trinitro- (LIMPRICHT), A., i, 145.

p-Toluylisobutyric acid, ethyl ester (BLAISE), A., i, 253.

o-Toluylformamide (GOLDSCHMIDT), A., i, 709.

3-*p*-Toluylpicolinic acid and its oxidation products (FULDA), A., i, 226.

p-Toluquinol, bromoamino-, bromonitro-, and chloroamino-, and their acetyl derivatives, and dibromonitro- (ZINCKE), A., i, 330.

p-Toluquinone, chloronitro- and bromonitro-derivatives of (ZINCKE), A., i, 330.

Toluquinonebenzoyl- α -naphthylhydrazine (McPHERSON and GORE), A., i, 572.

p-Toluquinoneditolylimide, amino-, and action of *p*-toluidine and its hydrochloride and alcohol on (BÖRNSTEIN), A., i, 375.

p-Toluquinophthalone. See *p*-Methylquinophthalone.

m-Tolyl borate (MICHAELIS and HILLRINGHAUS), A., i, 356.

o-Tolyl carbonate (CHEMISCHE FABRIK VON HEYDEN), A., i, 696.

o-Tolyl methyl ether, trinitro- (KAUFLE and WENZEL), A., i, 590.

p-Tolyl methyl ether, diamino- and dinitro- (KAUFLE and WENZEL), A., i, 590.

p-Tolylallophanic acid, ethyl ester (PICKARD and CARTER), T., 844; P., 1901, 123.

p-Tolylallylsemithiocarbamide, nitro- (POPE and HIRD), T., 1144; P., 1901, 186.

o-Tolylaminobenzyl cyanide (SACHS), A., i, 272.

p-Tolylaminophenylsulphone and its acetyl derivative (BAMBERGER and RISING), A., i, 202.

p-Tolylanilinephenylthiocarbimide, thio- (v. MEYER, NACKE, and GMEINER), A., i, 265.

p-Tolylbiuret (PICKARD and CARTER), T., 844; P., 1901, 123.

p-Tolyl-borobromide and -boroxide (MICHAELIS and RICHTER), A., i, 355.

p-Tolylcarbazinic acid and chloride, ethyl esters (BUSCH and HEINRICHS), A., i, 617.

(*Tolyl compounds* $Mc=1$.)

p-Tolyldiethylphosphorketobetaine derivatives (MICHAELIS and KRAHE), A., i, 303.

2-*o*-Tolyldiketohydrindene and its 2-benzoyl, 2-benzyl, 2-ethyl and 2-methyl derivatives (GOLDBERG), A., i, 33.

dioxime, phenylhydrazone, and bromo-, chloro-, and nitro-derivatives of (GOLDBERG), A., i, 33.

4-*p*-Tolyl-2:6-dimethyldihydropyridine-3:5-dicarboxylic acid, ethyl ester (FLÜRSCHHEIM), A., i, 387.

1-*o*- and -*p*-Tolyl-2:5-dimethyl-1:3:4-triazoles and their salts (PELLIZZARI and ALCATORE), A., i, 571.

2:3-Tolylenediamine, 6-chloro-, and its combination with dihydroxytartaric acid (COHN), A., i, 637.

Tolylene-*p*-diamine, chloro-, and its diacetyl derivative, and hydrochloride and sulphate (VORLÄNDER and SCHRÖDTER), A., i, 463.

1:3:4-Tolylenefurazan, nitro- (ZINCKE and DROST), A., i, 73.

o-Tolyethylisocarbamide and its platinum-chloride (McKEE), A., i, 756.

β -*p*-Tolyglutaric acid (FLÜRSCHHEIM), A., i, 388.

o-Tolyglycine, nitroso- (VORLÄNDER), A., i, 463.

action of hydrogen chloride on (VORLÄNDER and SCHRÖDTER), A., i, 463.

m-Tolyglyoxylic acid, *p*-amino-, and its phenylhydrazone (BOEHRINGER & SONS), A., i, 714.

Tolyl-4-hydrazine, 3-nitro-, and its acetyl derivative (POPE and HIRD), T., 1141; P., 1901, 186.

p-Tolyldiazine- α -thiocarbonyl-chloride- β -carboxylic acid, ethyl ester (BUSCH and GROHMANN), A., i, 617.

p-Tolyldihydroxyoxamide and its acetyl derivative, reactions of (PICKARD and CARTER), T., 843; P., 1901, 123.

Tolyliminobenzoyl cyanides, *o*- and *p*-, and their *p*-nitrobenzoyl derivatives (SACHS), A., i, 272.

5-*p*-Tolyl-3-methyleyclohexenone and its oxime, and 4:6-dicarboxylic acid, ethyl ester (FLÜRSCHHEIM), A., i, 388.

p-Tolyl methyl ketone, selenium derivatives of (KUNCKELL and ZIMMERMANN), A., i, 215.

catechol-, resorcinol-, and quinol-carbohydrazones (EINHORN and ESCALES), A., i, 653.

(*Tolyl compounds Me = 1.*)

- 1-*p*-Tolyl-5-methylpyrazole and its 4-mono- and 3:4-di-carboxylic acids and its diethyl ester (BÜLOW and SCHLESINGER), A., i, 98.
- 9-Tolyl-10-methylisorosinduline (FISCHER and BRUNN), A., i, 417.
- p*-Tolynaphthionic acid (WITT and SCHNEIDER), A., i, 699.
- α -Tolylnitromethane and the isonitro-derivative (GOLDBERG), A., i, 33.
- Tolyloxymethane, *o*-, *m*-, and *p*-, action of sulphuric acid on (RUHEMANN and BAUSO), T., 472; P., 1901, 40.
- 1-*p*-Tolyloxymethylbenzoxazole (COHN), A., i, 752.
- 2-*p*-Tolyloxymethyl-5 ethoxybenzimidazole and its picrate (COHN), A., i, 352.
- 3-Tolylphenotriazones, *o*-, *m*-, and *p*- (MEHNER), A., i, 471.
- Tolylphthalide and amino- and trinitro- (LIMPRICHT), A., i, 146.
- nitro- (LIMPRICHT), A., i, 145, 147.
- p*-Tolytrosinduline chlorides, 10-chloro-5-, and 10-chloro-6-*m*-amino- (KEHRMANN and HIBY), A., i, 419.
- Tolylsemicarbazide, nitro- (POPE and HIRD), T., 1143; P., 1901, 186.
- p*-Tolylsulphoncarbinol and its phosphate and acetyl derivative (v. MEYER, NACKE, and GMEINER), A., i, 264.
- p*-Tolylsulphoncarbinylaniline (v. MEYER, NACKE, and GMEINER), A., i, 264.
- p*-Tolylsulphonedi- β -naphthoxyethylamide (MARCKWALD and CHAIN), A., i, 380.
- p*-Tolylsulphonehydroxylamine and its dibenzoyl derivative (v. MEYER, NACKE, and GMEINER), A., i, 265.
- p*-Tolylthiodiazolone-anilthiol, -thio-methane, and *p*-tolylthiomethane (BUSCH and WOLPERT), A., i, 234.
- 1-Tolyl-1:3:4-triazoles, *o*- and *p*-, and their salts (PELLIZZARI and BRUZZO), A., i, 570.
- p*-Tolyltrimethylammonium bromide, *o*-nitro- (PINNOW), A., i, 413.
- p*-Tolylurethane, interaction of, with aniline (DIXON), T., 104; P., 1900, 208.
- Topaz, occurrence of, near Ouro Preto, Brazil (DERBY), A., ii, 169.
- from New South Wales (HARKER), A., ii, 320.
- Tourmaline, crystallographic constants and chemical composition of (WÜLFING), A., ii, 65.
- Toxicological analysis. See Analysis.
- effect of tellurium compounds (MEAD and GIES), A., ii, 261.
- Toxins, artificial modifications of (RITCHIE), A., ii, 464.
- action of proteolytic enzymes on (BALDWIN and LEVENE), A., ii, 667.
- action of peroxides on (SIEBER), A., ii, 566.
- Tragacanth. See Gum tragacanth.
- Tragacanthan-xylan-bassoric acids and their salts (O'SULLIVAN), T., 1178; P., 1901, 156.
- Tragacanthose (O'SULLIVAN), T., 1182; P., 1901, 157.
- Transparency of matter for X-rays, laws of (BENOIST), A., ii, 215, 216, 308; (HÉBERT and REYNAUD), A., ii, 215.
- Transport numbers. See Electrochemistry.
- Trapa natans*. See Agricultural Chemistry.
- Travertine from Vichy (GIRARD and BORDAS), A., ii, 561.
- Tremolite from Pisek, Bohemia (KREJČÍ), A., ii, 607.
- from Roumania (PONI), A., ii, 26.
- Triacetonealkamine. See Hydroxy-2:2:6:6-tetramethylpiperidine.
- Triacetoneamine and its compounds with the alkali metals (MERCK), A., i, 670.
- Triacetonedicarbamide (WEINSCHENK), A., i, 583.
- Triacetyl-. See also Parent Substance.
- Triacetylchloroarabinose, preparation of (RYAN and MILLS), T., 706; P., 1901, 90.
- Triazan derivatives (VOSWINCKEL), A., i, 53, 617.
- p*-Triazoacetanilide and *m*-Triazoacetophenone (RUPE and v. MAJEWSKI), A., i, 104.
- Triazoanisoles, *o*- and *p*- (RUPE and v. MAJEWSKI), A., i, 104.
- o*-Triazobenzaldehyde, synthesis of (BAMBERGER and DEMUTH), A., i, 392, 621.
- and its dibromo- and dichloro-derivatives and their phenylhydrazones (BAMBERGER and DEMUTH), A., i, 392.
- p*-Triazobenzaldehyde (RUPE and v. MAJEWSKI), A., i, 104.
- o*-Triazobenzaldoxime (BAMBERGER and DEMUTH), A., i, 392.
- Triazobenzoic acids, *o*-, *m*-, and *p*-, methyl esters, and the nitrile of the *p*-acid (RUPE and v. MAJEWSKI), A., i, 104.
- p*-Triazobromobenzene (RUPE and v. MAJEWSKI), A., i, 104.

- 2-Triazo-3:5-dimethyl-benzoic acid, and -benzaldehyde and its *p*-nitrophenylhydrazones (BAMBERGER and DEMUTH), A., i, 391.
- 1:3:4-Triazole, derivatives of (PELLIZZARI and MASSA), A., i, 488; (PELLIZZARI and BRUZZO), A., i, 570; (PELLIZZARI and ALCIATORE), A., i, 571.
- Triazoles, chemistry of the (YOUNG and OATES), T., 659; P., 1901, 86.
- Triazopyrocatechol methylene ether (RUPE and v. MAJEWSKI), A., i, 104.
- Tribenzophosphinic acid (MICHAELIS and OHM), A., i, 303.
- Tribenzoyl-. See also Parent Substance.
- Tribenzoylanthracene (LIPPMANN and KEPPICH), A., i, 37.
- Tribenzoyltetrahydroanthracene (LIPPMANN and KEPPICH), A., i, 38.
- Tribenzylacetonedicarboxylic acid, ethyl ester (FICHTER and SCHIESS), A., i, 544.
- Triboluminescence (TSCHUGAEFF), A., ii, 489.
- Tricarballic triazoidimide and trihydrazide and their derivatives (CURTIUS and HESSE), A., i, 70.
- Tri- ψ -cumylphosphine derivatives (MICHAELIS and KARCHOWSKI), A., i, 304.
- Tridecanaphthene, chloro- (MABERY and SIEPLEIN), A., i, 306.
- Tridecyl alcohol (*diethyloctylcarbinol*) (MASSON), A., i, 250.
- Tri-2:5-dimethylbenzaldehyde, *trithio*- (HARDING and COHEN), A., i, 726.
- 1:2:4-Triethoxybenzene and its bromo- and nitro-derivatives (BREZINA), A., i, 534, 701.
- Triethoxyethylbenzene and *di*bromo- (BREZINA), A., i, 701.
- Triethylamine, compound of, with α -chlorohydrin, and base from (BIENENTHAL), A., i, 128.
- Triethylammoniumiodoacetic acid, methyl ester (WEDEKIND), A., i, 639.
- Triethylglyceryltriurethane (CURTIUS and HESSE), A., i, 71.
- Triethylmelamine and Triethylisomelamine, absorption spectra of (HARTLEY, DOBBIE, and LAUDER), T., 861; P., 1901, 125.
- Triethoxamines, supposed existence of two isomeric (DUNSTAN and GOULDING), T., 641; P., 1901, 85.
- Triheptyl alcohol (GUERBET), A., i, 183.
- 1:2:4-Trihydroxybenzene, alkylation of (BREZINA), A., i, 700.
- $\alpha\beta\gamma$ -Trihydroxybutyric acid, synthesis of (PREY), A., i, 501.
- Trihydroxybutyric acid. See also *l*-Erythronic acid.
- 5:7:2'-Trihydroxyflavone and its triacetyl derivative (v. KOSTANECKI and WEBEL), A., i, 479.
- 5:7:3'-Trihydroxyflavone and its triacetyl derivative (v. KOSTANECKI and STEUERMANN), A., i, 223.
- Trihydroxyiminotriphenacylamine and its hydrochlorides (KORTEN and SCHOLL), A., i, 550.
- Trihydroxypentane (*pentaglycerol*) (KOCH and ZERNER), A., i, 633.
- Trihydroxypentanathrene, chloro- (BERTHEIM), A., i, 467.
- 2:2':2''-Trihydroxy-1:1':1''-trinaphthylmethane, *iso*anhydride of, and its acetyl compound and methyl and ethyl ethers (FOSSE), A., i, 323.
- $\beta\gamma\delta$ -Triketopentane and its dihydrate, dianil and bisphenylhydrazones (SACHS and BARSCHALL), A., i, 670.
- Trimesic acid (*benzene-1:3:5-tricarboxylic acid*), reduction of, and its methyl and ethyl esters (LAWRENCE and PERKIN), P., 1901, 47.
esters (WISLICENUS and BINDEMANN), A., i, 361.
- Trimesitylphosphine derivatives (MICHAELIS and LOEBNER), A., i, 304.
- 2:4:6-Trimethoxybenzoyl-3'-ethoxyacetophenone (v. KOSTANECKI and STEUERMANN), A., i, 223.
- 2:4:6-Trimethoxybenzoyl-3':4'-methylenedioxyacetophenone (v. KOSTANECKI, RÓŻYCKI, and TAMBOR), A., i, 92.
- 2:4:6-Trimethoxybenzoylpyruvic acid, ethyl ester (v. KOSTANECKI, PAUL, and TAMBOR), A., i, 735.
- 3:4:5-Trimethoxybenzylmethylamine. See Mezealine.
- 2:4:6-Trimethoxy-2'-ethoxybenzoylacetophenone (v. KOSTANECKI and WEBEL), A., i, 479.
- 5:7:3'-Trimethoxy-4'-ethoxyflavone (DILLER and v. KOSTANECKI), A., i, 476.
- $\alpha\beta\delta$ -Trimethyladipic acid (NOYES), A., i, 632.
- Trimethylamine, compounds of, with mono- and *s*-di-chloro- and bromomethyl ethers (LITTERSCHEID), A., i, 443.
- $\alpha\beta\delta$ -Trimethylanthracetonebenzil (JAFF and MELDRUM), T., 1040; P., 1901, 176.
- 1:3:5-Trimethylbenzene. See Mesitylene.
- Trimethylbenzoic acid, preparation of (VAN-SCHERPENZEEL), A., i, 328.

- 2:4:6-Trimethylbenzoic acid, *dinitro*-, and its chloride, anilide, and phenylhydrazide (KUNCKELL and HILDEBRANDT), A., i, 552.
- Trimethylbenzoylbenzene-*o*-sulphonic acids, 2:4:5- and *s*-, and their salts (KRANNICH), A., i, 153.
- 2:4:6-Trimethylbenzylidene-aniline, -*p*-chloroaniline, and -*ψ*-cumidine (HANTZSCH and SCHWAB), A., i, 379.
- Trimethylbrazilin, preparation and oxidation of (GILBODY, PERKIN, and YATES), T., 1399; P., 1899, 28, 75, 241; 1900, 105.
- Trimethylchlorobutanetricarboxylic acid, ethyl ester (PERKIN, THORPE, and WALKER), T., 790.
- Trimethylcincholeuponic acid, diethyl ester, salts of (SKRAUP), A., i, 227.
- 3:4:4-Trimethylidihydrobenzene, 2:6-*di*-chloro- (CROSSLEY), T., 144.
- Trimethylene dibromide, action of, on benzene, in presence of aluminium chloride (BODROUX), A., i, 196.
- Trimethylene (cyclopropane), action of bromine on, under different conditions (GUSTAVSON), A., i, 3.
- 1:2:3-*tricyano*- (ERRERA and PERCIABOSCO), A., i, 18.
- Trimethylenecarbamide (CURTIUS and CLEMM), A., i, 69; (TAFEL and WEINSCHEK), A., i, 72.
- Trimethylene-carbinol, -carbinyamine, and -carboxylic chloride (HENRY and DALLE), A., i, 582.
- Trimethylenecarboxylic acid, amide and amine of (KJNER), A., i, 509.
- Trimethylenediamine. See Propaue, *αγ*-diamino-.
- 3:4-*cyclo*Trimethylenepyrzalone (DIECKMANN), A., i, 539.
- Trimethylenepyrrole, synthesis of (GUARESCHI), A., i, 341.
- Trimethylenetricarboxylic acid, and cyano-, and the ethyl ester of the tricyano-derivative (ERRERA and PERCIABOSCO), A., i, 18; (WENZEL), A., i, 402.
- αβ*-Trimethylglutaric acid (*hexanedicarboxylic acid*), and its anilic acid (CROSSLEY), T., 140; P., 1900, 91. attributed synthesis of (BLANC), A., i, 119.
- Trimethyl-tetra- and -hexa-hydrobenzyl-anilines and the chloro-derivative of the hexahydro-compound (FARBWERKE VORM. MEISTER, LUCIUS, and BRÜNING), A., i, 691.
- Trimethylhexamethylene, chloro- (MABERY and SIEPLEIN), A., i, 306.
- Trimethylcyclohexanes, 1:3:4- and 1:3:5- (SABATIER and SENDERENS), A., i, 159.
- Trimethylhydroxybutanetricarboxylic acids, lactones and anhydrides of (PERKIN, THORPE, and WALKER), T., 788; P., 1901, 110.
- Trimethylketodicyclopentane-mono- and -*di*-carboxylic acids (PERKIN, THORPE, and WALKER), T., 786; P., 1901, 110.
- Trimethylketodicyclopentanetricarboxylic acid, ethyl ester and potassium salt (PERKIN, THORPE, and WALKER), T., 786.
- 1:3:3-Trimethyl-2-methyleneindoline, formula of (BRUNNER), A., i, 407; (PLANCHER), A., i, 563.
- βεθ*-Trimethyl-*ε*-nonene (GRIGNARD), A., i, 681.
- ββγ*-Trimethylpentane-*αγ*-olidoic acid (BLANC), A., i, 119.
- 2:4:6-Trimethylphenyl-acetylene and -chloroacetylene (KUNCKELL and KORITZKY), A., i, 75.
- Trimethylphloroglucinol ethyl ether (HERZIG and HAUSER), A., i, 206.
- 1:4:6-Trimethylpurone and its acetyl derivative, and 1:4:6-Trimethylisopurone (TAFEL), A., i, 238.
- 2:4:6-Trimethylpyridine from Scottish shale oil (GARRETT and SMYTHE), P., 1900, 190.
- Trimethylsuccinic acid (LAPWORTH and LENTON), P., 1901, 148. resolution of, into its optical antipodes (PAOLINI), A., i, 253.
- Trimethylthujylammonium hydroxide and iodide (TSCHUGAEFF), A., i, 601.
- Trimethyltrimethylene glycols and dibromides and *di*iodide (ZELINSKY and ZELIKOFF), A., i, 657.
- Trimethyltrimethylenes, $\Delta^{1,1,2}$. and $\Delta^{1,2,3}$. (ZELINSKY and ZELIKOFF), A., i, 657.
- Trimethyltriase (*dihydroxydihydro-mesityl oxide*) (HARRIES and PAPFOS), A., i, 673.
- 1:4:4-Trimethyltrimethylenedicarbonimide, 3:5-*di*cyano- (GUARESCHI), A., i, 342.
- βζμ*-Trimethyltriskaideka-*βζθλ*-tetrene-*κ*-one and its isomeride (DURAND, HUGUENIN & Co. and PHILIPPE BARBIER), A., i, 727.
- 2:4:6-Trimethylstyrene, *αβ*-*di*chloro- (KUNCKELL and KORITZKY), A., i, 75.
- Triocetyl alcohol, synthesis of, and its acetic ester (GUERBER), A., i, 307.
- Trioxymethylene, action of acid chlorides on (DESCUDÉ), A., i, 504, 644.
- Trioxytetramethylene, *di*chloro- (LITPENSCHIED), A., i, 443.
- Triphenylacetic acid (STOBBE and ZEITSCHEL), A., i, 538.

- Triphenylcarbinol**, reactions of (HERZIG and WENGRAF), A., i, 702.
- 1:4:5-Triphenyldihydro-1:2:4-triazole-3-thiomethane** (BUSCH and WOLPERT), A., i, 235.
- 2:3:5-Triphenylfurfuran** (JAPP and MICHIE), T., 1024; P., 1901, 174.
- Triphenylguanidine guaiacolsulphonate** (GOLDSCHMIDT), A., i, 643.
- Triphenylmethane** and its derivatives, carbinol compounds of (HERZIG and WENGRAF), A., i, 702.
- ω -chloro-, preparation of (GOMBERG), A., i, 77, 319, 374; (NORRIS and SANDERS), A., i, 198.
- compound of, with zinc chloride (GOMBERG), A., i, 638.
- ω -iodo- (GOMBERG), A., i, 77.
- Triphenylmethane colouring matters**, new (GRIMAUX), A., i, 269.
- absorption spectra of (CAMICHEL and BAYRAC), A., i, 296.
- relation between their chemical constitution and the absorption spectra of their aqueous solutions (LEMOULT; CAMICHEL), A., i, 100.
- Triphenylmethyl** (GOMBERG), A., i, 77, 690.
- compounds of, with ether and with ethyl acetate (GOMBERG), A., i, 638.
- peroxide and its hexanitro- (GOMBERG), A., i, 77, 319.
- See also Diphenylphenylenemethane.
- 1:2:3-Triphenyl-4:2- β -naphthaisooxazine** (BETTI), A., i, 612, 778.
- Triphenyl-1:2-oxypyrrro-1:4-diazole**. See 4:5-Oxy-1:3:4-triphenylosotriazole.
- 2:3:5-Triphenylpyrrole**, 4-nitroso-, and its ethyl ether, benzoyl derivative, and phenylcarbimide (ANGELICO and CALVELLO), A., i, 747.
- Triphenylsilicol** and its chloride and acetyl derivative (KIPPING and LLOYD), T., 452; P., 1901, 32.
- Triphenylthiotriazolone** (SCHALL), A., i, 766.
- 1:2:5-Triphenyl-1:3:4-triazole** and its hydrochloride (PELLIZZARI and ALCIATORE), A., i, 571.
- Triphenyltrimesic acid** and its ethyl esters, molecular weight of (MANTHEY), A., i, 31.
- Triplite** from Moravia (v. JOHN), A., ii, 248.
- Tripropylamine**, compound of, with α -chlorohydrin, and base from (BIENENTHAL), A., i, 129.
- oxide (MAMLOCK and WOLFFENSTEIN), A., i, 673.
- Tristearin**, specific heat of (VANDEVYVER-GRAU), A., ii, 46.
- Tritolylchloromethane** and its derivatives (GOMBERG and VOEDISCH), A., i, 374.
- Tri-*p*-tolylphosphine** derivatives (MICHAELIS and OHM), A., i, 302.
- Tri-*p*-tolylphosphoroketobetaine** derivatives (MICHAELIS, HOSSEUS, and KRAHE), A., i, 303.
- Tri-*p*-tolylsulphonamide** (v. MEYER, NACKE, and GMEINER), A., i, 264.
- Tritonium Snodosum*, free aspartic acid in (HENZE), A., ii, 178.
- Triundecenoic acid**, anhydride and glyceride of (THOMS and FENDLER), A., i, 252.
- Trixylylphosphines**, *m*- and *p*-, and their derivatives (MICHAELIS, HEINE, and SCHAEUBLE), A., i, 304.
- Tropan**, synthesis of (WILLSTÄTTER), A., i, 650.
- methobromide, bromo-, and the platinichloride of the methochloride (WILLSTÄTTER), A., i, 225.
- methobromide and methochloride, 6-bromo- (WILLSTÄTTER), A., i, 651.
- methochloride and methiodide and 2-bromo- of the methiodide (WILLSTÄTTER), A., i, 650.
- Tropan**, 3-bromo- (WILLSTÄTTER), A., i, 744.
- Tropanol** methobromide, ψ -bromo- (WILLSTÄTTER), A., i, 226.
- Tropidine**, synthesis of (WILLSTÄTTER), A., i, 225, 651.
- conversion of, into tropine (WILLSTÄTTER), A., i, 744.
- iso*Tropidine, synthesis of (WILLSTÄTTER), A., i, 224.
- methiodide (WILLSTÄTTER), A., i, 651.
- Tropilidene**. See $\Delta^{1,3,6}$ -cycloHeptatriene.
- ψ -**Tropinecarbonic acid** and its additive salts (WILLSTÄTTER and BODE), A., i, 482.
- Tropinone** and its compounds with the alkali metals (MERCK), A., i, 370.
- conversion of, into *r*-cocaine (WILLSTÄTTER and BODE), A., i, 482.
- Trouton's law**, generalisation of (DE FORCRAND), A., ii, 372.
- Truxone**, and chloro- (MANTHEY), A., i, 31.
- Trypsin**, chemical nature of (LEVENE), A., i, 576.
- role of the spleen in the formation of (HERZEN; CAMUS and GLEY), A., ii, 324.
- action of, on fibrin (VERNON), A., i, 576.
- action of, on proteids (LAWROFF; DZIERZGOWSKI and SALASKIN), A., ii, 666; (MUCHIZUKI), A., ii, 667.

- Trypsin** in yeast (HAHN and GERET), A., i, 59; ii, 677; (KUTSCHER), A., ii, 466, 523.
- Tryptic activity**, estimation of (SAMOILOFF), A., ii, 401.
- Tuberculosis**, respiratory exchange in (ROBIN and BINET), A., ii, 327.
use of lecithin in (CLAUDE and ZAKY), A., ii, 673.
- Tungsten** (DEFACQZ), A., ii, 244.
specific heat of (DEFACQZ and GUICHARD), A., ii, 659.
- Tungsten alloys**, production of, in the electric furnace (SARGENT), A., ii, 105.
with aluminium (GUILLET), A., ii, 388.
estimation of chromium and manganese in (IBBOTSON and BREARLEY), A., ii, 198.
- Tungsten arsenide** and chloroarsenide (DEFACQZ), A., ii, 163.
boride (TUCKER and MOODY), P., 1901, 129.
trioxide, separation of, from molybdenum trioxide (RUEGENBERG and SMITH), A., ii, 75.
- Tungstic acid**, estimation of (HERTING), A., ii, 284.
separation of, from silicic acid (HERTING), A., ii, 284; (WELLS and METZGER), A., ii, 534.
- Tungsten monophosphide** (DEFACQZ), A., ii, 105.
- Tungsten**, detection and estimation of:—
detection of (DEFACQZ), A., ii, 244, 284.
estimation of, in ores (BULNHIMER), A., ii, 41.
estimation of, in steel and steel-making alloys (IBBOTSON and BREARLEY), A., ii, 199.
Schöffel's process for estimating, in steel (BAGLEY and BREARLEY), A., ii, 200.
- Tungsten-steel**, analysis of (HERTING), A., ii, 284.
- Turgite** from the Uspensk Mine, South Urals (SAMOILOFF), A., ii, 605.
- Turquoise**, chemical composition of (PENFIELD), A., ii, 27.
- Tutin** from New Zealand Coriariae (EASTERFIELD and ASTON), T., 120; P., 1900, 211.
and coriaryrtin, comparison of the properties of (EASTERFIELD and ASTON), T., 125; P., 1900, 212.
- Tutu**, poisonous glucosides of (EASTERFIELD and ASTON), T., 120; P., 1900, 211.
- Tyrosine**, reactions of (DUCCESCHI), A., i, 354.
- L-Tyrosine ethyl ester** and its piperazine derivative (FISCHER), A., i, 193.

U.

- Uganda-aloin** (*capaloin*), and its dibenzoyl derivative (TSCHIRCH and KLAVENESS), A., i, 602.
- Ulexite**, synthesis of (DE SCHULTEN), A., ii, 558.
- Umbelliferoncarboxylic acids**. See Hydroxycoumaroncarboxylic acids.
- Umbilicarie** and **Umbilicarinic acids** (HESSE), A., i, 596.
- Uncinatic acid** from lichens (HESSE), A., i, 150.
- Undecanaphthene**, chloro- (MABERY and SIEPLEIN), A., i, 306.
- Undecanedicarboxylic acid** (KRAFFT and SELDIS), A., i, 115; (KOMPPA), A., i, 365.
- Undecenamidoxime** (KRAFFT and TRITSCHLER), A., i, 115.
- Undecenoic acid**, oxidation of, with permanganate (THOMS and FENDLER), A., i, 186.
- θ -Undecenoic acid**, and its amide, bromine derivatives, and salts (KRAFFT and SELDIS), A., i, 115.
- κ -Undecenoic anhydride** and its *tetra*-bromide, amide, chloride and nitrile (KRAFFT and TRITSCHLER), A., i, 115.
- Undecinene**. See $\beta\zeta$ -Dimethyl- $\beta\zeta\theta$ -nonatriene.
- Undecyl alcohol** (*disoamylcarbinol*) (GRIGNARD), A., i, 250, 680.
- κ -Undecylene**, amino-, and its benzoyl derivative and phenylthiocarbamide (KRAFFT and TRITSCHLER), A., i, 115.
- Undecylenic acid**, hydrobromides of (WALKER and LUMSDEN), T., 1191; P., 1901, 188.
- Undecylic acid**, ω -bromo-, and its isomeride (WALKER and LUMSDEN), T., 1193; P., 1901, 188.
- Unsaturated compounds**, tendency of carbon atoms in, to interlink (ERLENMEYER), A., i, 373.
addition of hydrogen and other simple molecules to (ERLENMEYER), A., i, 357.
addition of ketomethane derivatives to (VORLÄNDER), A., i, 84.
- Uracil** from yeast nuclein (ASCOLI), A., i, 108.
- Uralitised diallage** from the Ardennes (KLEMENT), A., ii, 321.
- Uranium**, preparation of (ALOY), A., ii, 317.
pyrophoric (FÉRÉE), A., ii, 514.
new method of determining the atomic weight of (ALOY), A., ii, 214.

- Uranium amalgam** (FÉRÉE), A., ii, 514.
- Uranium nitrate** (OECHSNER DE CONINCK), A., ii, 104, 105, 164, 165, 390.
 electrolysis of (OECHSNER DE CONINCK and CAMO), A., ii, 556.
- melanitride** (KOHLSCHÜTTER), A., ii, 598.
- sescquioxide** (OECHSNER DE CONINCK), A., ii, 165.
- sulphate** (OECHSNER DE CONINCK), A., ii, 390, 660.
- Uranium**, estimation of, electrolytically (KOLLOCK and SMITH), A., ii, 695.
- Uranium minerals**, occurrence of helium and nitrogen in (KOHLSCHÜTTER), A., ii, 598.
 analysis of (FRITCHLE), A., ii, 200.
- "Uranium red"** (KOHLSCHÜTTER), A., ii, 165.
- Urano-oxalic acid** and its salts (KOHLSCHÜTTER and ROSSI), A., i, 448.
- Uranyl chloride**, hydrochloride of, and compounds of, with potassium and sodium chlorides (ALOY), A., ii, 164.
 and water (MYLIUS and DIETZ), A., ii, 660.
 nitrate, preparation of, on a large scale (JANDA), A., ii, 603.
- Uraster rubens**, orange pigment of (GRIFFITHS and WARREN), A., i, 94.
- Urazines**, constitution of the (BUSCH), A., i, 488, 616.
- Urazoguanazole** and imino- (PELLIZZARI and RONCAGLIOLI), A., i, 773.
- Urazoiminoourazole**, imino- (PELLIZZARI and RONCAGLIOLI), A., i, 774.
- Urazole**, imino-, and its diacetyl derivative (PELLIZZARI and RONCAGLIOLI), A., i, 773.
- Urazole series**, syntheses in the (BUSCH), A., i, 488; (BUSCH and GROHMANN), A., i, 616; (BUSCH and HEINRICH), A., i, 617.
- Urea**, formation of, in the body (v. GULEWITSCH), A., ii, 29.
 formation of, by the oxidation of albumin (HUGOUNENQ), A., i, 491.
 amount of, in urine (JOB), A., ii, 139.
 estimation of (BRAUNSTEIN), A., ii, 140; (POLLAK), A., ii, 210.
 estimation of, in urine (BRAUNSTEIN), A., ii, 140; (FOLIN), A., ii, 630; (LONG), A., ii, 705.
 See also Carbamide.
- Urease**, decomposition of carbamide by (BEYERINCK), A., ii, 264.
- Urethane**, action of, on aromatic diamines (MANUELLI and RECCHI), A., i, 49.
- Urethanes**, interaction of, with primary benzenoid amines (DIXON), T., 102; P., 1900, 207.
- Urethanophenyl-acetamide, -acetonitrile, and -acetoxamidine** and its acetyl derivative (LEHMANN), A., i, 275.
- Urethylcoumarone** (STOERMER and CALOV), A., i, 336.
- Uric acid**, synthesis of, from cyanoacetic acid (TRAUBE), A., i, 54.
 formation of, in the liver of birds (KOWALEWSKI and SALASKIN), A., ii, 671.
 and its salts, behaviour of, in solution, and estimation of, in its salts (HIS and PAUL), A., i, 131.
 oxidation of, by ammonium persulphate (HUGOUNENQ), A., i, 242.
 reduction of, electrolytically (TAFEL), A., i, 236.
 commercial, presence of guanine in (HUGOUNENQ), A., i, 262.
 spontaneous conversion of, into carbamide (GIGLI), A., i, 677.
 influence of nitrogenous food on the excretion of (MAUREL), A., ii, 565.
 estimation of, in urine (BOUILLET), A., ii, 290; (FOLIN and SHAFFER), A., ii, 585.
- Urinary bladder**, non-permeability of the wall of the (COHNHEIM), A., ii, 564.
 constituents, influence of lecithin on (ZAKY), A., ii, 673.
- Urine**, action of currents of high frequency on the secretion of (DENOYÉS, MARTRE, and ROUVIÈRE), A., ii, 564, 611.
 alcapton, benzoylation of (ORTON and GARROD), A., ii, 614.
 action of dimethylaminobenzaldehyde on (PRÖSCHER), A., ii, 260.
 effect of certain purine derivatives on the excretion of (ACH), A., ii, 31.
 effect of sodium chloride on the excretion of (THOMPSON), A., ii, 30.
 action of isotonic solutions of sodium chloride and sulphate on (MAGNUS), A., ii, 67.
 in cystinuria, diaceturia, and indicanuria (KOBERT), A., ii, 68.
 acidity of (BERTHELOT), A., ii, 611.
 electrometric determination of the acidity of (v. RHORER), A., ii, 672.
 acids in the, after feeding with citral (HILDEBRANDT), A., ii, 181, 669.
 an albumose in (MILROY), A., ii, 68.
 influence of certain diuretics on the amount of alkali in (KATSUYAMA), A., ii, 407.
 excretion of antipyrine in (LAWROFF), A., ii, 463.

Urine, excretion of cacodylic acid in (BARTHE and PÉRY), A., ii, 364.
 amount of carbohydrates in diabetic and normal (ROSIN; v. ALFTHAN), A., ii, 179.
 variations in the amount of chlorides and nitrogen in, during insufficient nutrition (JAVAL), A., ii, 565.
 organic chlorine compounds in (VILLE and MOITESSIER), A., ii, 565.
 indoxyllic origin of red colouring matters of (MAILLARD), A., ii, 407.
 red colouring matter in, after administration of pyramidone (JAFFÉ), A., ii, 672.
 creatinine in (GREGOR), A., ii, 67.
 iron of normal (NICOLA), A., ii, 326.
 relationship of iron in, and in the blood (JOLLES and WINKLER), A., ii, 30.
 kynurenic acid in (MENDEL and SCHNEIDER), A., ii, 259, 565; (GIES), A., ii, 407.
 amount of nitrogen in, after extirpation of the liver (LANG), A., ii, 407.
 influence of caffeine on nitrogenous excretion (RIBAUT), A., ii, 565.
 amount of phosphorus in, during inanition (SCHULZ and MAINZER), A., ii, 407.
 influence of diet on the phosphoric acid and sodium chloride in (MAUREL), A., ii, 565.
 excretion of phosphorus oxygen compounds in (GAMEL), A., ii, 610.
 oxidation of the organic compounds of (JOLLES), A., ii, 259.
 influence of caffeine and theobromine on the excretion of purine substances in (KRÜGER and SCHMID), A., ii, 463.
 nature of the sugar in (PAVY and SIAU), A., ii, 257.
 sugars in diabetic (LÉPINE and BOULUD), A., ii, 409.
 amount of urea in (JOB), A., ii, 139.
 influence of nitrogenous food on the amount of uric acid in (MAUREL), A., ii, 565.

Urine, analytical processes relating to:—

detection of acetanilide in (PETERMANN), A., ii, 485.
 detection of acetic acid in (LIPILAWSKY), A., ii, 428.
 detection of albumin in (PRAUM; ROCH), A., ii, 710.
 the precipitation of albumin in, by clarifying agents (GRÜTZNER), A., ii, 295.
 detection of antithermic substances in (PETERMANN), A., ii, 293.

Urine, analytical processes relating to:—

detection of bilirubin in, by Ehrlich's diazo-reaction (PRÖSCHER), A., ii, 296.
 detection of cacodylic acid in (HEFFTER), A., ii, 464.
 containing iodides, detection of indican in (KÜHN), A., ii, 487.
 detection of mercury in (BARDACH), A., ii, 579.
 detection of peptone in (FREUND), A., ii, 710.
 detection of sugar in (OFFER), A., ii, 354; (RIEGLER), A., ii, 426.
 Neumann's modification of Fischer's phenylhydrazine test for sugar in (MARGULIES), A., ii, 135.
 the phenylhydrazine test in the absence of sugar in (JOLLES), A., ii, 425.
 estimation of acetone in, gasometrically (RIEGLER), A., ii, 361.
 estimation of alkaloids in (GUILLEMARD), A., ii, 521.
 estimation of ammonia in (FOLIN), A., ii, 575.
 cell for the clinical estimation of hæmoglobin in (ADAM), A., ii, 488.
 estimation of β -hydroxybutyric acid in (BERGELL), A., ii, 701.
 estimation of indican in (WOŁOWSKI), A., ii, 293; (BOUMA), A., ii, 487.
 estimation of iron in human (HOFFMANN), A., ii, 326.
 estimation of nitrogen in, for clinical purposes (JOLLES), A., ii, 688.
 estimation of the nitrogen of amino-acids in (KRÜGER and SCHMID), A., ii, 290.
 estimation of sugar in (PATEIN), A., ii, 355.
 estimation of small amounts of sugar in (RAIMANN), A., ii, 582.
 estimation of sugar in, by Lehmann's method (GOETZEL-ALBERS), A., ii, 355.
 estimation of urea in (BRAUNSTEIN), A., ii, 140; (FOLIN), A., ii, 630; (LONG), A., ii, 705.
 estimation of uric acid in (BOUILLET), A., ii, 291; (FOLIN and SHAFER), A., ii, 585.
Urinometer (JOB), A., ii, 139; (GIRARDET), A., ii, 362.
Urotropine. See Hexamethylenetetramine.
Usnetol (HESSE), A., i, 151.
Usnic acids from lichens (HESSE), A., i, 85, 149, 595; (ZOPF), A., i, 87, 546; (SALKOWSKI), A., i, 152.
Usnidic acid (HESSE), A., i, 595.

V.

*iso*Valeraldehyde, condensation products of (ROSINGER), A., i, 669.
condensation of, with acetaldehyde (WOGGINZ), A., i, 254.
*iso*Valeraldehyde-aniline and *p*-toluidine, reduction of (EIBNER and PURUCKER), A., i, 168.
Valeranilide, α -cyano- (HALLER and BLANC), A., i, 261.
Valerhydroxamic acid (BAMBERGER and SCHEUTZ), A., i, 548.
Valerian, an oxydase in (CARLES), A., i, 59.
Valeric acid, calcium salt, dry distillation of (DILTHER), A., i, 498.
Valeric acid, amino-, and its phenyl-carbimide (FISCHER), A., i, 781.
 $\alpha\delta$ -diamino-, synthesis of (FISCHER), A., i, 191.
 α -chloro-, and its chloride, nitrile, and ethyl ester (SERVAIS), A., i, 112.
 δ -chloro-, and its ethyl ester (MELLOR), T., 132.
Valeric acid (*α -methylbutyric acid*), α -chloro-, and its chloride, nitrile, and ethyl ester (SERVAIS), A., i, 113.
*iso*Valeric acid, phenyl ester (AUTENRIETH), A., i, 186.
*iso*Valeric acid, α -chloro-, and its chloride, nitrile, and ethyl ester, and α -bromo- (SERVAIS), A., i, 112.
 α -iodo-, and its salts (ZERNOFF), A., i, 185.
*iso*Valeric anhydride (AUTENRIETH), A., i, 186.
Valerolactoneacetic acid and its salts (FITTIG and ROTH), A., i, 121.
 γ -Valerolactone- α -carboxylic acid, δ -chloro-, ethyl ester, sodium salt and hydrazido-ester, and dichloro- and chlorobromo- (TRAUBE and LEHMANN), A., i, 501.
Valerolactone- γ -carboxylic acid, α -*iso*-nitroso- (WOLFF and HEROLD), A., i, 503.
Valeronitrile, specific heat and latent heat of evaporation of (KAHLENBERG), A., ii, 492.
*iso*Valerylanthranilic acid (GOTTHELF), A., i, 766.
i-Valerylidenedianiline anhydrosulphite (EIBNER), A., i, 378.
Vanadium, cosmic diffusion of (HASSELBERG), A., ii, 251.
arc spectrum of (LOCKYER and BAXANDALL), A., ii, 489.
Vanadium ores, analysis of (FRITCHLE), A., ii, 200.
Vanilla plant from the Congo, sap of the (HÉBERT), A., ii, 34.

Vanillideneaminophenylguanidine picrate (PELLIZZARI and RICKARDS), A., i, 769.
Vanillin, estimation of, in presence of piperonaldehyde (HANUS), A., ii, 206.
Vapour density, determination of, under reduced pressure (SCHALL), A., ii, 87.
See also Density.
Vapour pressure (PONSOT), A., ii, 542.
Dupré-Rankine's law relating to (JULIUSBURGER), A., ii, 86.
exact relation between osmotic pressure and (NOYES), A., ii, 87; (DIETERICI), A., ii, 439.
of aqueous ammonia solution (PERMAN), T., 718; P., 1901, 46.
influence of neutral salts on the (GAUS), A., ii, 7.
influence of sodium sulphate on (PERMAN), T., 725; P., 1901, 47.
of a series of benzene compounds (WINKELMANN), A., ii, 57; (WORINGER), A., ii, 87.
of mixed crystals of isomorphous salts (HOLLMANN), A., ii, 436.
of mixtures of hydrogen chloride and methyl ether (KUENIN), A., ii, 146.
in mixtures of two liquids (v. ZAWIDZKI; TAYLOR), A., ii, 7.
of binary mixtures (SCHREINEMAKERS), A., ii, 9, 57; (KOHNSTAMM), A., ii, 145; (CAUBET), A., ii, 147; (DUHEM), A., ii, 372; (KOHNSTAMM and VAN DALFSEN), A., ii, 641.
influence of foreign substances on the (SCHREINEMAKERS), A., ii, 641.
apparatus for determining the (v. ZAWIDZKI), A., ii, 6.
of ternary mixtures (SCHREINEMAKERS), A., ii, 9, 57, 146, 224, 305, 372, 436, 641.
maximum, at 25° of solutions of the chlorides and sulphates of magnesium and potassium, the solutions being saturated with sodium chloride (VAN'T HOFF and v. EULER-CHLÉPIN), A., ii, 249.
of aqueous alcoholic salt solutions (WREWSKY), A., ii, 56.
of sodium chloride solution, determination of the decrease of, at higher temperatures (SMITHS), A., ii, 304.
of solutions (PONSOT), A., ii, 593.
of solutions which are not very dilute, determination of the decrease in (SMITHS), A., ii, 304, 436.
of water at temperatures between -12° and 25°, especially at 0° (THIERSEN and SCHEEL), A., ii, 86.

- Vapours**, solvent action of (LINCOLN), A., ii, 89.
 combustible, and air, explosion of mixtures of (KUBERSCHKY), A., ii, 232.
- Vapour tension**. See Vapour pressure.
- Vegetable matter**, estimation of proteid nitrogen in (FRAPS and BIZZELL), A., ii, 140.
- Vegetables**. See Agricultural Chemistry.
- Velocity of chemical change**. See Affinity.
- Veratric acid**, *dichloro*-, and its methyl ester (MAZZARA), A., i, 720.
- Veratric chloride** and amide (MEYER), A., i, 628.
- Vesuvius**, simultaneous production of two nitrogen compounds in the crater of (MATTEUCCI; GAUTIER), A., ii, 63.
- Vetches**. See Agricultural Chemistry.
- Vetiver**, oil of (THEULIER), A., i, 397.
- Vinegar**, new indicator for determining the acidity of (RUNYAN), A., ii, 629.
 detection of methyl alcohol in (ROBINE), A., ii, 353, 480.
- Vines**. See Agricultural Chemistry.
- α -Vinyl diacetonealkamine**. See 4-Hydroxy-2:6:6-trimethylpiperidine.
- Vinyl diacetoneamine** and its compounds with the alkali metals (MERCK), A., i, 670.
- Vinylglycollic acid**. See α -Hydroxy- β -butenoic acid.
- Violaquercitrin** (PERKIN), P., 1901, 88.
- Violein** and its triacetate (THIELE and JAEGER), A., i, 723.
- Viscosity** (*internal friction*), relation of, to other physical constants (BAT-SCHINSKI), A., ii, 433.
 of chrome alum solutions (FERRERO), A., ii, 494.
 of gases as affected by temperature (RAYLEIGH), A., ii, 9.
 of liquids in relation to temperature and chemical constitution (BAT-SCHINSKI), A., ii, 645.
 of mixtures of liquids and solutions (LEES), A., ii, 148.
 of some essential oils (JEANCARD and SATIE), A., i, 394.
 of mixtures of solutions of salts, relation of, to their state of ionisation (BARNES), A., ii, 374.
- Vitellin** (LEVENE and ALSBERG), A., i, 300.
- Vitrified quartz** (SHENSTONE), A., ii, 552.
- Voudouzia subterranea*. See Agricultural Chemistry.
- Volatility** of lead oxide (STOERMER), A., ii, 654.
- Voltmeter**. See Electrochemistry.
- Volume**, atomic, relation between atomic weight, melting point and (BAYLEY), A., ii, 497.
 molecular, determination of, in organic solvents (CARRARA and LEVI), A., ii, 3.
 specific, as the determining criterion of chemical combination in alloys (MAEY), A., ii, 655.
 of liquids at infinite pressure (PAGLIANI), A., ii, 644.
 of liquid and saturated vapour, relation between the temperature changes of the (VAN DER WAALS), A., ii, 305.

W.

Wall-paper, arsenical gas from (BIGINELLI), A., i, 20.

WATER:—

- constitution of (WITT), A., ii, 498.
 molecular constitution of (SUTHERLAND), A., ii, 92.
 dielectric constant of (TURNER), A., ii, 54.
 vapour tension of, at temperatures between -12° and 25° , especially at 0° (THIESEN and SCHEEL), A., ii, 86.
 specific gravity of solutions of alcohol, ether, and (BUSNIKOFF), A., i, 306.
 absorption of the vapour of, by chemical compounds (BUSNIKOFF), A., ii, 58, 496.
 equilibrium in the system, acetone, phenol and (SCHREINEMAKERS), A., ii, 445.
 equilibrium between acid, alcohol, ester, and (EULER), A., ii, 307.
 equilibrium in the system, ether, succinonitrile and (SCHREINEMAKERS), A., ii, 641.
 composition of the vapour phase of the system aniline and, and aniline, phenol and (SCHREINEMAKERS), A., ii, 9, 57.
 composition of the vapour phase in the system phenol and, with one or two liquid phases (SCHREINEMAKERS), A., ii, 9, 57.
 influence of, as solvent, on the rotation of ethyl tartrate (PATTERSON), T., 171; P., 1900, 176.

NATURAL WATERS:—

- detection, at the source, of metals present in small quantities in (GARRIGOU), A., ii, 75.
 estimation of dissolved gases in (WINKLER), A., ii, 696.
- Blood or red rain**, composition of, from Sicily (JEAN and BRUHAT), A., ii, 456.

NATURAL WATERS :—

Blood or red rain at Palermo in March, 1901 (MEUNIER), A., ii, 322.

deposit which fell in Victoria, Australia, composition of (PIHPSON), A., ii, 516.

Moorland waters, the origin of the combined chlorine in (ACKROYD), T., 673 ; P., 1901, 87.

River waters of the Province Rhinessen in the Rheingau and Taunus (LUEDECKE), A., ii, 417.

of the Rhône, presence of ferrous oxythiocarbonate in the (CAUSSE), A., ii, 61.

Lake water of the salt lakes of Roumania (BUJOR), A., ii, 114.

Spring and mineral waters, variation in the composition of, detected by electrical conductivity (MULLER), A., ii, 456.

alumina in (PARMENTIER), A., ii, 516.

simultaneous presence of barium and sulphates in (CARLES), A., ii, 506.

lithiniferous, analysis of (RANZOLI), A., ii, 423.

hot sulphuretted, origin of (GAUTIER), A., ii, 322.

sulphuretted, estimation of sulphides, hydrosulphides, polysulphides, and thiosulphates in (GAUTIER), A., ii, 277.

thermal, of Achkel (PUAUX), A., ii, 27.

of Boston Spa, barium in the (RICHARDS), A., ii, 252.

of the Cévennes Spring at Ucel (Ardèche) (BARRAL), A., ii, 252.

hot, of Gastein, Salzburg (LUDWIG and PANZER), A., ii, 114.

from the Kiedrich Spring, near Eltville, Rhine (FRESENIUS), A., ii, 66.

sulphated calcareous, at Lautaret (Hautes-Alpes) (MULLER), A., ii, 114.

of Roumania (PONT), A., ii, 27.

of Salsomaggiore, organic iodine in the (MONTANARI), A., ii, 664.

of Val Sinestra, Lower Engadine (NUSSBERGER), A., i, 322.

hot, from Vals, Lugnez Valley (NUSSBERGER), A., ii, 322.

from Western Australia (SIMPSON), A., ii, 454.

Sea water, evaporation of (VAN'T HOFF and EULER-CHELPIN), A., ii, 249.

action of, on pozzuolana mortar (REBUFFAT), A., ii, 18.

from the Red Sea (NATTERER), A., ii, 173.

LXXX. ii.

NATURAL WATERS :—

Potable waters, chlorine peroxide as a steriliser of (REYCHLER), A., ii, 548.

Well waters, alkaline, from the chalk (FISHER), A., ii, 627, 665.

of the Province Rheinessen in the Rheingau and Taunus (LUEDECKE), A., ii, 417.

Trafalgar Square (FISHER), A., ii, 665.

Water analysis :—

analysis of well (FISHER), A., ii, 627.
reaction characteristic of pure (CAUSSE), A., ii, 581.

analysis and softening of, for boilers (GIORGIS and FELICIANI), A., ii, 581.

detection of ammonia in, by mercuric chloride (FERRARO), A., ii, 192.

detection of arsenic in (GOSIO), A., ii, 193.

detection of *Bacillus coli communis* in, by neutral-red (MAKGILL ; SAVAGE), A., ii, 696.

detection of acid carbonates in (POZZI-ESCOT), A., ii, 346.

detection of cystin in (MOLINIÉ), A., ii, 42 ; (CAUSSE), A., ii, 133.

detection of lead in (BELLOCQ), A., ii, 349.

improvement of the diphenylamine test for nitrates in (HEFELMANN), A., ii, 532.

detection of nitrates in, with brucine and glacial formic acid (CAZENEUVE and DÉFOURNEL), A., ii, 532.

estimation of air in (PELLET), A., ii, 75.

estimation of ammonia, nitric and nitrous acids in (WINKLER), A., ii, 627.

estimation of calcium in (GASSELIN), A., ii, 133.

estimation of calcium and magnesium in (WINKLER), A., ii, 347.

estimation of organic carbon in (KÖNIG), A., ii, 351.

estimation of carbon dioxide in (ELLS and BENEKER), A., ii, 627.

estimation of the hardness of (MORPURGO), A., ii, 133 ; (PLEISSNER), A., ii, 425.

estimation of nitric acid in (KOSTJAMIN), A., ii, 38 ; (HENRIET), A., ii, 422 ; (CAZENEUVE and DÉFOURNEL), A., ii, 532 ; (WINKLER), A., ii, 627.

estimation of nitrous acid in (WINKLER), A., ii, 627.

estimation of oxidisable organic matter in (FRERICHS), A., ii, 201.

Water analysis :—

source of error in the permanganate process for estimating organic matter in (DUYK), A., ii, 351.

estimation of dissolved oxygen in, in presence of nitrites and of organic matter (RIDEAL and STEWART), A., ii, 472.

estimation of phosphates in (WOODMAN and CAYAN), A., ii, 344 ; (LEPIERRE), A., ii, 689.

estimation of sulphuric acid in (HARTLEB), A., ii, 627 ; (WINKLER), A., ii, 628.

estimation of, volumetrically, in alcohol (BULL), A., ii, 137.

elimination and estimation of, in fats, oils, and waxes (DAVIS), A., ii, 629.

estimation of, in mixtures of organic substances and sodium hydrogen carbonate (KÖNIG), A., ii, 473.

Water. See also Steam.

Water chestnut. See Agricultural Chemistry.

Wax, bees', distillation of (GRESHOFF and SACK), A., i, 446.

assay of (BUCHNER), A., ii, 208.

testing of (WERDER), A., ii, 139.

$C_{37}H_{74}O_2$, found on the leaves of the wild banana tree (GRESHOFF and SACK), A., i, 445.

from the wild fig tree (GRESHOFF and SACK), A., i, 445.

analysis of (DIETERICH), A., ii, 139.

optical examination of (MARPMANN), A., ii, 431.

modification of Hübl's method of estimating the acid and saponification numbers of (EICHORN), A., ii, 48.

elimination and estimation of water in (DAVIS), A., ii, 629.

Weight, conservation of, lecture experiments to demonstrate the principle of (SALVADORI), A., ii, 547.

Weight, molecular, at the boiling point (DE FORCRAND), A., ii, 594.

determination of, use of pyridine for by the ebullioscopic method (INNES), T., 261 ; P., 1900, 223.

of aluminium compounds and salts (KÖHLER), A., ii, 21.

of chloral hydrate at the boiling point (DE FORCRAND), A., i, 668.

of glycogen (JACKSON), A., i, 371.

of indigo-blue and indigo-red (VAUBEL), A., i, 714.

of ozone (LADENBURG), A., ii, 232 ; (OTTO), A., ii, 380.

of triphenyltrimesic acid and its ethyl esters (MANTHEY), A., i, 31.

Weldon-deposit, testing of (JURISCH ; LUNGE), A., ii, 198.

Wheat. See Agricultural Chemistry.

Wine, manufacture of (BÖTTINGER), A., ii, 269.

analysis of (BOLM), A., ii, 203.

dilution of, and its detection (GAUTIER, CHASSEVANT, and MAGNIER DE LA SOURCE ; JEAN), A., ii, 353.

new indicator for determining the acidity of (RUNYAN), A., ii, 629.

detection of alum in (LOPRESTI), A., ii, 198.

detection of citric acid in (SPICA), A., ii, 701.

detection of "orchil red," orchil, cochineal, phytolacca and beetroot red in (BELLIER), A., ii, 210.

detection of "saccharin" in (WIRTHLE), A., ii, 135, 704.

detection of salicylic acid in (PEREIRA), A., ii, 428 ; (FERREIRA DA SILVA), A., ii, 585.

detection and estimation of salicylic acid in (PELLET), A., ii, 701.

source of error in testing, for salicylic acid (PELLET), A., ii, 207 ; (FERREIRA DA SILVA), A., ii, 291.

detection of starch-sugar in (DELLE), A., ii, 44.

detection of added sulphuric acid in (CARPENTIERI), A., ii, 191.

estimation of volatile acids and chlorides in (KLEIBER), A., ii, 629.

occurrence and estimation of lactic acid in (KUNZ), A., ii, 700.

estimation of malic acid in (HILGER), A., ii, 290.

estimation of phosphoric acid in (SARTORI ; Woy), A., ii, 344.

estimation of sulphurous acid in (PATUREL), A., ii, 628.

Wollastonite from Galle (COOMARA-SWAMY), A., ii, 171.

Wood, products of the hydrolysis of (STORER), A., i, 67.

Wood oil, composition of (FRAPS), A., i, 188.

Wool, action of nitrous acid on (LIDOFF), A., i, 243.

X.

Xanthine, synthesis of, from cyanoacetic acid (TRAUBE), A., i, 54.

electrolytic reduction of (TAFEL and ACH), A., i, 425.

Xanthorhamnin, sugars of (VOTOČEK and FRÍČ), A., i, 161.

Xenon, isolation of, from air (DEWAR), A., ii, 597.

- (*o*-Xylene, *Me* : *Me* = 1:2 ; *m*-xylene, *Me* : *Me* = 1:3 ; *p*-xylene, *Me* : *Me* = 1:4.)
- Xenon**, separation and spectra of (LIVING and DEWAR), A., ii, 598.
physical properties of (RAMSAY and TRAVERS), A., ii, 238.
refraction of (RAMSAY), A., ii, 141.
- Xylan-bassoric acid** (O'SULLIVAN), T., 1182 ; P., 1901, 157.
- Xylene**, nitro^dnitroso- (ZINCKE and DROST), A., i, 73.
- o*-Xylene, dichlorinated (FERRAND), A., i, 636.
- Xylenes**, bromination and iodination of (EDINGER and GOLDBERG), A., i, 22, 23.
- Xylenes**, *o*-, *m*-, and *p*-iodo- (EDINGER and GOLDBERG), A., i, 22.
nitroso- (BAMBERGER and RISING), A., i, 530, 531, 532.
- m*-Xyleneazoisimine, 2:5- or 5:6-*d*initro- (ZINCKE and DROST), A., i, 73.
- m*-Xylenediazoaminobenzoic acid, and its methyl ester (MEHNER), A., i, 471.
- Xylenehydroxylamines** (BAMBERGER and RISING), A., i, 530, 531, 532.
- 1:2-Xylene-3-sulphinic and -3-sulphonic acids** (MOSCHNER), A., i, 374.
- 1:3-Xylene-5-sulphinic acid and -5-sulphonic chloride and amide** (MOSCHNER), A., i, 374.
- 1:3-Xylene-5-sulphonic acid** and its salts, amide, bromide, chloride, anilide and toluidide (ARMSTRONG and WILSON), P., 1900, 230.
- p*-Xylenesulphonic acid, purification of (KRAFFT and WILKE), A., i, 74.
- m*-Xylenol, tribromo-, and its ψ -quinol and acetyl derivative (ZINCKE), A., i, 205.
- m*-4-Xylenol, 2-amino-, and its sulphate (BAMBERGER and RISING), A., i, 531.
bromo-derivatives of (NÖLTING, BRAUN, and THESMAR), A., i, 589.
- Xylenols**, 1:2:3- and 1:3:5-, 6- and 2-nitroso- (FISCHER and CAMMERLOHER), A., i, 418.
- m*-5-Xylenol-4-sulphonic acid, 2-amino- (BAMBERGER and RISING), A., i, 531.
- β* -*m*-Xylenoxycinnamic acid and its ethyl ester (RUHEMANN and WRAGG), T., 1187 ; P., 1901, 187.
- m*-Xylenoxyfumaric acid and its ethyl ester (RUHEMANN and WRAGG), T., 1118 ; P., 1901, 187.
- β* -*m*-Xylenoxystyrene (RUHEMANN and WRAGG), T., 1188 ; P., 1901, 188.
- Xylic acid**. See Dimethylbenzoic acid.
- Xylidine**, action of ethylene dibromide on (SENIER and GOODWIN), T., 254 ; P., 1900, 228.
- 1:2:5-Xylidine**, cyanoacetyl derivative of (GROTHE), A., i, 80.
- Xylidines**, 1:2:5- and 1:3:4-, chloroacetyl, phenylsulphoneacetyl, *p*-tolylsulphoneacetyl, thioglycolyl, sulphonediacetyl, and thiocyanacetyl derivatives of (GROTHE), A., i, 79, 80.
- Xylidines**, bromo- and nitro-derivatives of, and their acetyl and benzoyl compounds (NÖLTING, BRAUN, and THESMAR), A., i, 588.
- 1:2:4-Xylidine-6-sulphonic acid**, its potassium salt and acetyl derivative (ARMSTRONG and WILSON), P., 1900, 229.
- l*-Xylonic acid, oxidation of (RUFF and KOHN), A., i, 449.
- m*-Xyl mercaptan (WHEELER and JOHNSON), A., i, 707.
- m*-Xyllyborobromide (MICHAELIS and RICHTER), A., i, 356.
- Xylly-borochlorides**, -boroxides, and -boric acids, *o*-, *m*-, and *p*- (MICHAELIS and THEVÉNOT), A., i, 355.
- p*-Xyllyene bromide, action of, on primary, secondary, and tertiary amines and on alkaloids (MANOUKIAN), A., i, 528.
- p*-Xylylenedichlorodimalonic acid and its potassium salt (EPHRAIM), A., i, 689.
- m*-Xylylenediaceoacetic acid, ethyl ester (EPHRAIM), A., i, 688.
- m*-Xylylenediamine ($\text{Me}_3(\text{NH}_2)_2 = 1:3:2:4$) and its dibenzoyl derivative (BAMBERGER and DEMUTH), A., i, 209.
- Xylylenediamines**, four isomeric (NÖLTING, BRAUN, and THESMAR), A., i, 588.
- p*-Xylylenedimethyldimalonic acid and its ethyl ester and potassium salt (EPHRAIM), A., i, 689.
- Xylylenediphenylpiperidonium bromides** (SCHOLTZ), A., i, 483.
- o*-Xylylenehydrazine and its hydrochloride and picrate (FRÄNKEL), A., i, 44.
- o*-Xylylenimine. See Dihydroisindole.
- cyclo-o*-Xylylene-1:3-dithio-2-phenyl- and -2-dimethyl-methylene and their disulphones (AUTENRIETH and HENNINGS), A., i, 560.
- o*-Xylylideneⁿphthalide, *o*-cyano- and nitro-, and dinitrite (GOLDBERG), A., i, 32.
- m*-Xyllyl methyl ketone, selenium derivative of (KUNCKELL and ZIMMERMANN), A., i, 215.
- 1:3-Xyllyl-5-oxide**, 2:2'-diamino-, and its hydrochloride and acetyl derivative (BAMBERGER and RISING), A., i, 532.
- 1:2:4-Xyllylphenyldiguanide** and its nitrate (CRAMER), A., i, 772.

β -2 5-Xylylpropionic acid (HARDING and COHEN), A., i, 726.

***o*-Xylylthiazoline**, and its pierate and platinumchloride and 5-methyl derivative (GOLDBERG), A., i, 33.

Y.

Yeast, nutrition of (STERN), T., 943 ; P., 1901, 126 ; (THOMAS), A., ii, 617.

intracellular nutrition of (KAYSER), A., ii, 263.

agglutination of (BARENDRECHT), A., ii, 677.

autofermentation of (KUTSCHER), A., ii, 466.

pressed, autofermentation and liquefaction of (HARDEN and ROWLAND), T., 1227 ; P., 1901, 189.

action of chemical agents on (BOKORNY), A., i, 437.

and diastase, combined action of, on starch granules (MORRIS), T., 1085 ; P., 1901, 178.

proteolytic enzyme of (HAHN and GERET), A., i, 59 ; ii, 677 ; (KUTSCHER), A., ii, 466, 523.

oxydase in (GRÜSS), A., ii, 615.

sterilised, zymase from (BUCHNER), A., i, 179.

Yeasts, preparation of bottom fermentation, and the method of using them (JACQUEMIN), A., ii, 567.

fermentation experiments with sugars and (LINDNER), A., ii, 182, 263.

selection of carbohydrates by different, during alcoholic fermentation (KNECHT), A., ii, 568.

Yeast cells, growth of, in concentrated saline solutions (CLERFEYD), A., ii, 677.

occurrence and disappearance of glycogen in (MEISSNER), A., ii, 263.

Yeast-cell-plasma, expressed (Buchner's zymase) (MACFADYEN, MORRIS, and ROWLAND), A., i, 59 ; (BUCHNER), A., i, 108.

Yeast extract, Buchner's (WRÓBLEWSKI), A., ii, 465, 616.

influence of phosphates on the fermentative action of (WRÓBLEWSKI), A., ii, 328, 616.

Ylang-ylang oil, benzyl alcohol from (v. SODEN and ROJAHN), A., i, 733.

Ytterbia and Yttria, isolation of (G. and E. URBAIN), A., ii, 160.

Z.

Zeagonite. See Gismondite.

Zeolite from Valledel Zuccanti (ONGARO), A., ii, 396.

Zinc, occurrence of, in the vegetable kingdom (FRICKE), A., ii, 34 ; (LABAND), A., ii, 467.

presence of, in alcohol (ROMAN and DELLUC), A., ii, 40.

melting point of (HOLBORN and DAY), A., ii, 85.

rate of solution of, in acids (ERICSON-AURÉN), A., ii, 451.

action of, on *Aspergillus niger* (RICHTER), A., ii, 567.

Zinc alloys with copper, thermochemistry of (BAKER), A., ii, 303.

with copper and with tin, density of (MAEY), A., ii, 655.

Zinc salts, action of substituted ammonia bases on (HERZ), A., ii, 240.

Zinc bromide and chloride, compounds of, with cupric oxide (MAILHE), A., ii, 601.

chloride, compound of, with triphenylchloromethane (GOMBERG), A., i, 638.

haloids, compounds of, with bases of the pyridine series (TOMBECK), A., i, 164.

Zinc organic compounds :—

ethyl, action of, on acid anhydride, oxides, and lactones (GRANICHSTÄDTEN and WERNER), A., i, 518.

indigo-white (BINZ), A., i, 593.

Zinc, detection, estimation and separation of :—

precipitation of, by hydrogen sulphide in acid solution (STULL), A., ii, 625.

test for, in alcohol (ROMAN and DELLUC), A., ii, 40.

estimation of, volumetrically (WALKER), A., ii, 625.

estimation of, by means of iodine solution (KNAPS), A., ii, 579.

estimation of, by organic bases (HERZ), A., ii, 240, 478.

estimation of, in iron-spar (FLATH), A., ii, 625.

separation of, from cobalt and nickel (TREADWELL and KRAMERS), A., ii, 281.

separation of, from copper (SÜDERBAUM), A., ii, 197.

Zinc blends, estimation of fluorine in (BÜLLHEIMER), A., ii, 191.

Zircon, colour of (v. KRAATZ-KOSCHLAU and WÖHLER), A., ii, 166 ; (SPEZIA), A., ii, 167.

Zirconium boride (TUCKER and MOODY),
P., 1901, 129.
thermochemistry of the hyper-acids of
(PISSARJEWSKY), A., ii, 56.
Zirconium earth in euxenite from Brevig
(HOFMANN and PRANDTL), A., ii, 387.
Zoisite from Roumania (PONT), A.,
ii, 26.

Zymase from sterilised yeast (BUCHNER),
A., i, 179.
simple experiment to illustrate the
action of (ALBERT), A., i, 180.
Buchner's. See Yeast-cell-plasma.
Zymogens of the stomach (GLAESSNER),
A., ii, 666.

ERRATA.

VOL. LXX (ABSTR., 1896).

PART I.

Page	Line	
302	15	<i>delete</i> "Phenylortho-hydroxybenzylcarbinol."
"	16	<i>for</i> " $\text{OH}\cdot\text{C}_6\text{H}_4\cdot\text{CH}_2\cdot\text{CHPh}\cdot\text{OH}$ " <i>read</i> " $\text{OH}\cdot\text{O}_6\text{H}_4\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{CHPh}\cdot\text{OH}$."

VOL. LXXII (ABSTR., 1897).

268	4	"	$\begin{array}{c} \begin{array}{cccc} 1 & 6 & 5 & 7 \\ \text{N} & \cdot & \text{C} & \cdot & \text{C} & \cdot & \text{N} \\ & & & & & & \\ \text{C} & \cdot & \text{N} & \cdot & \text{C} & \cdot & \text{N} \\ 2 & 3 & 4 & 8 \end{array} & \begin{array}{c} \diagup \\ \diagdown \end{array} & \text{C } 9 \end{array}$	<i>read</i>	$\begin{array}{c} \begin{array}{cccc} 1 & 6 & 5 & 7 \\ \text{N} & \cdot & \text{C} & \cdot & \text{C} & \cdot & \text{N} \\ & & & & & & \\ \text{C} & \cdot & \text{N} & \cdot & \text{C} & \cdot & \text{N} \\ 2 & 3 & 4 & 9 \end{array} & \begin{array}{c} \diagup \\ \diagdown \end{array} & \text{C } 8. \end{array}$
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VOL. LXXVIII (ABSTR., 1900).

PART II, INDEX.

	Col.	
908	30	ii <i>for</i> "T., 237" <i>read</i> "T., 327."

VOL. LXXX (ABSTR., 1901).

PART I.

15	22*	<i>for</i> " $\beta\beta\gamma\gamma$ -Tetraethylthiopentane" <i>read</i> " $\beta\beta\delta\delta$ -Tetraethylsulphonopentane."
16	13*	" γ -Amino-" <i>read</i> " δ -Amino-"
39	7	"phenlethyl" <i>read</i> "phenylethyl."
263	14*	"this vol., i, 210" <i>read</i> "this vol., i, 195."
292	9	" $\text{NO}_2\cdot\text{CH:N}\cdot\text{NPhMe}$ " <i>read</i> " $\text{NH}_2\cdot\text{CH:N}\cdot\text{NPhMe}$."
"	4* & 2* }	"phenylcarbazide" <i>read</i> "diphenylcarbazide."
293	4 & 7 }	
313	18*	"AcyI" <i>read</i> "Alkyl."
314	9	"and A. WEISS" <i>read</i> "[and A. WEISS]."
"	14	"dicarboxyglutaeonic" <i>read</i> "glutaeonic."
"	17	<i>after</i> "bimolecular" <i>insert</i> "dicarboxyglutaeonic."
377	19*	<i>delete</i> "hydrogen."
"	14*	<i>for</i> " H_2SO_3 " <i>read</i> " NaHSO_3 ."
379	15*	" $\text{OH}\cdot\text{CHPh}\cdot\text{C}_6\text{H}_4\text{Cl}$ " <i>read</i> " $\text{OH}\cdot\text{CHPh}\cdot\text{NH}\cdot\text{C}_6\text{H}_4\text{Cl}$."
"	11*	" $\text{OH}\cdot\text{CHPh}\cdot\text{C}_6\text{H}_4\text{Br}$ " <i>read</i> " $\text{OH}\cdot\text{CHPh}\cdot\text{NH}\cdot\text{C}_6\text{H}_4\text{Br}$."
423	21	"4:8-Diacetyl-amino-1:4-naphthaquinone" <i>read</i> "2:8-Diacetyl-amino-1:4-naphthaquinone."
486	4*	"1:3-tolyl-2-ethylhexahydropyrimidine" <i>read</i> "1:3-di-p-tolyl-2-ethylhexahydropyrimidine."
644	7	"Chlorine" <i>read</i> "Chloride."
745	6* & 5*	"4-hydroxy-2:2:6:6-tetramethylpiperidine" <i>read</i> "4-hydroxy-2:6:6-trimethylpiperidine."
"	3* & 2*	"4-hydroxy-2:2:6:6-tetramethylpiperidylphenylcarbamide" <i>read</i> "4-hydroxy-2:6:6-trimethylpiperidylphenylcarbamide."

* From bottom.

ERRATA (*continued*).

VOL. LXXX (ABSTR., 1901).

Page	Line	
745	2*	$\left. \begin{array}{l} \text{for } >C < \begin{array}{c} \text{CH}_2 \cdot \text{CMe}_2 \\ \text{CH}_2 \cdot \text{CMe}_2 \end{array} > \text{N- the ring in each case should have the} \\ \text{structure } >C < \begin{array}{c} \text{CH}_2 \cdot \text{CHMe} \\ \text{CH}_2 - \text{CMe}_2 \end{array} > \text{N-} \end{array} \right\}$
746	4	
"	11	
"	12	

PART II.

262	11*	"	"glycase" read "glucose."
353	21	}	"dimethylamine" read "dimethylaniline."
	22		
363	5	"	"JULES FOTH" read "JULIUS TÓTH."
552	11*	"	"1000°" read "1600°."
627	9—12	<i>delete</i>	"The sodium carbonate . . . further investigated."
675	3	<i>for</i>	" Fibres " read " Filters ."

* From bottom.



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